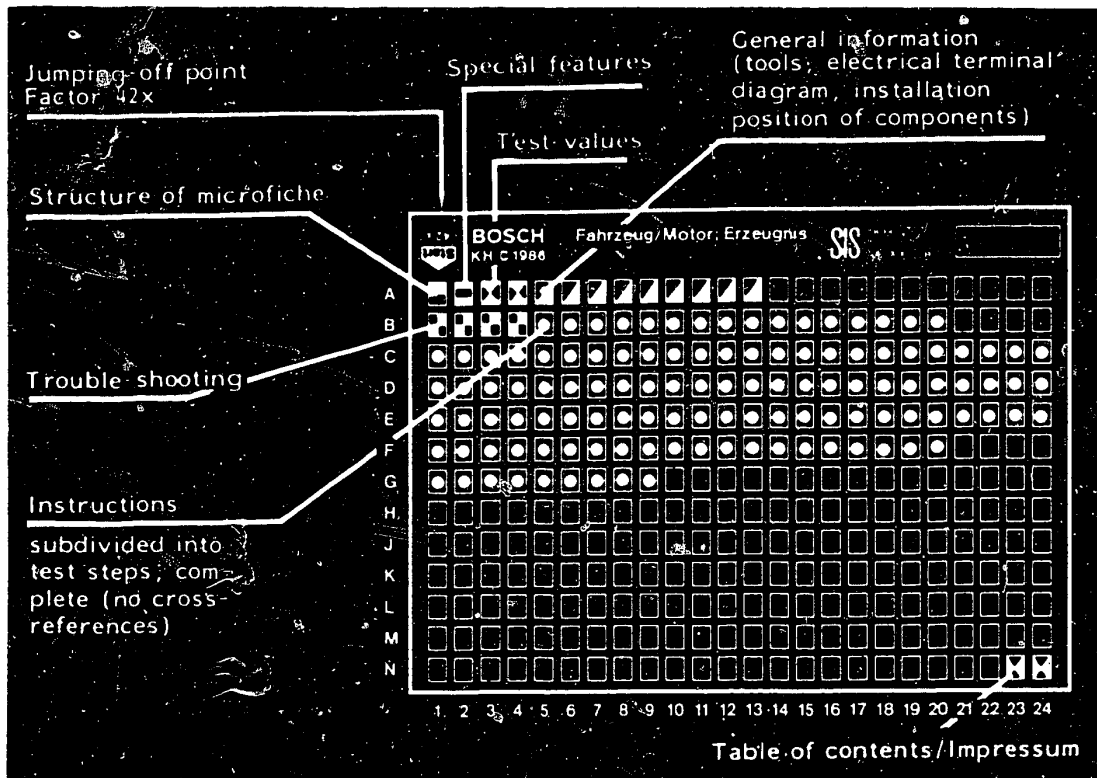


## Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

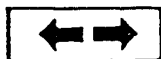
<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

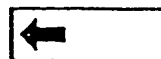
3. Limits of section



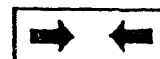
Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

**C6**

**A1**

Trouble-shooting program



## 1. SPECIAL FEATURES

The following vehicle models with / 4-cylinder Diesel engines with distributor-type fuel-injection pump are dealt with in this microcard:

- Opel Ascona Diesel (3. 1982 →)
- Opel Kadett Diesel (3. 1982 →)



## 2. Test specifications

2.1 Idle speed:

850 + 25 min<sup>-1</sup>

**C9**

2.2 Nozzle-opening pressure:

130 + 8 bar

→ 8.85

135 + 8 bar 9.85 →

**C12**

2.3 Filter test:

Max. permissible differential pressure = 0.3 bar

**C17**

2.4 Compression loss:

max. perm. 25%

**D4**

2.5 Injection timing

Engine position: TDC on cylinder 1

(the valves of cylinder 4 are on overlap)

Pump position: 1.0 ± 0.05 mm after BDC (→ 8.85)

0.9 ± 0.05 mm after BDC ( 9.85 →)

0.95 mm after BDC

for cold-starting problems

**G1**

2.6 Compression

20 ... 30 bar

at least

17 bar

**A3**

Test specifications

Opel Ascona/Kadett-Diesel

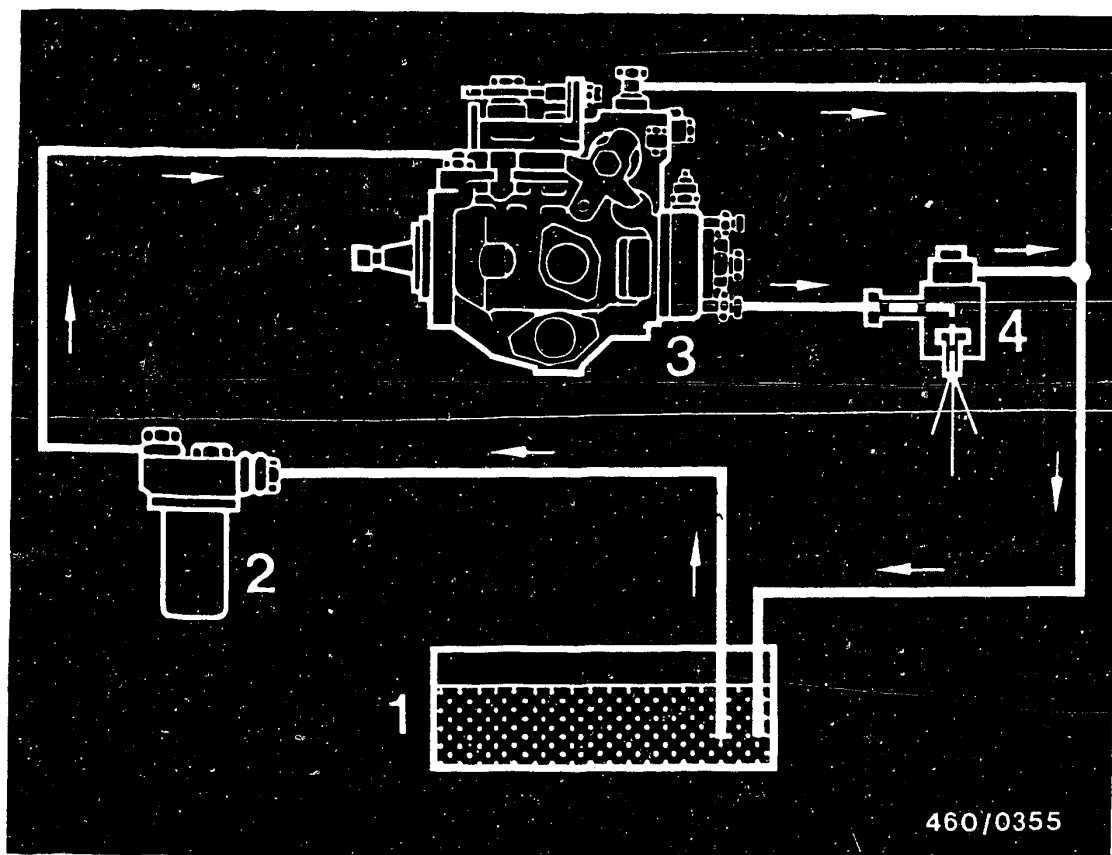


## 2.7 Tightening torques

	Nm	kgfm
Fuel-injection pump fastening screws	25	2.5
Fuel-injection pump gear	55	5.5
Camshaft gear	90	9.0
Pump hub fastening screws	25	2.5
Nozzle-holder assembly fastening screws	70	7.0
Fuel lines	25	2.5
Sheathed-element glow plugs	40	4.0







460/0355

- 1 = Fuel tank
- 2 = Fuel filter
- 3 = Distributor-type fuel-injection pump
- 4 = Injection nozzles

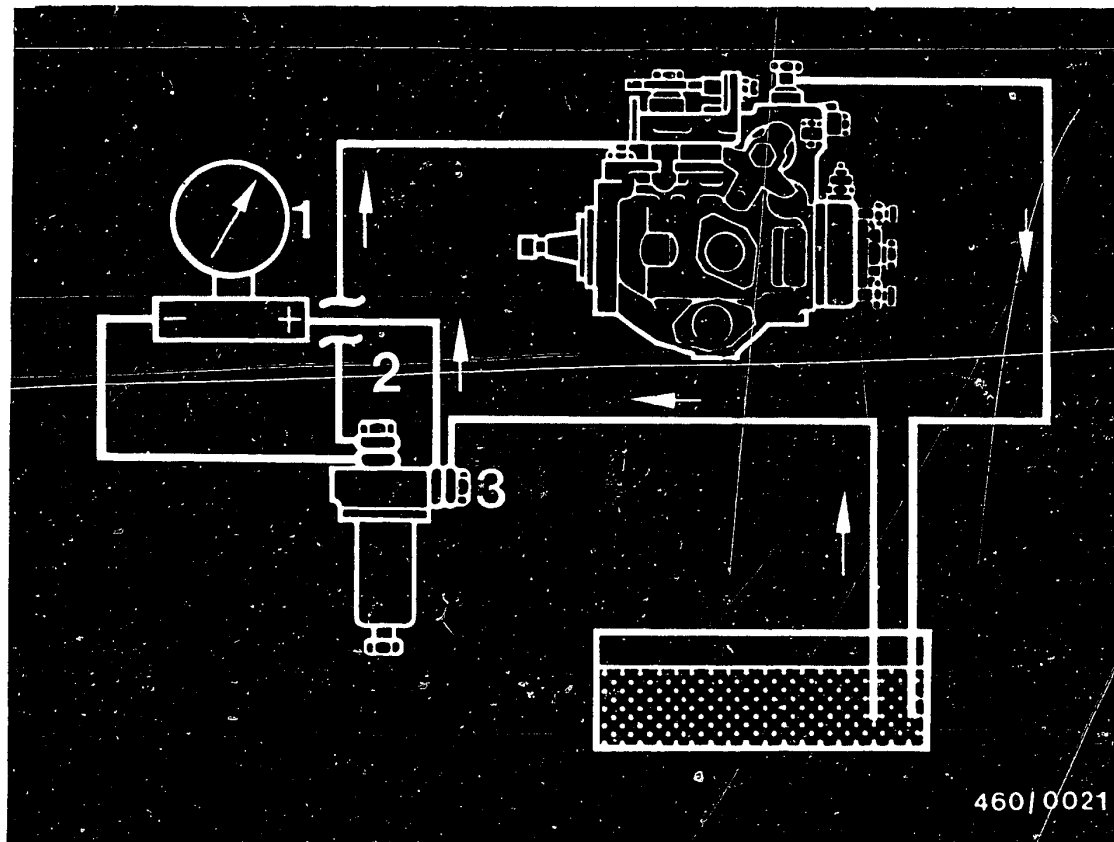
### 3. Connection diagrams of fuel lines

#### 3.1 Diagram of fuel lines

The fuel lines are connected as shown in the above diagram.

The fuel flows in the direction of the arrows.





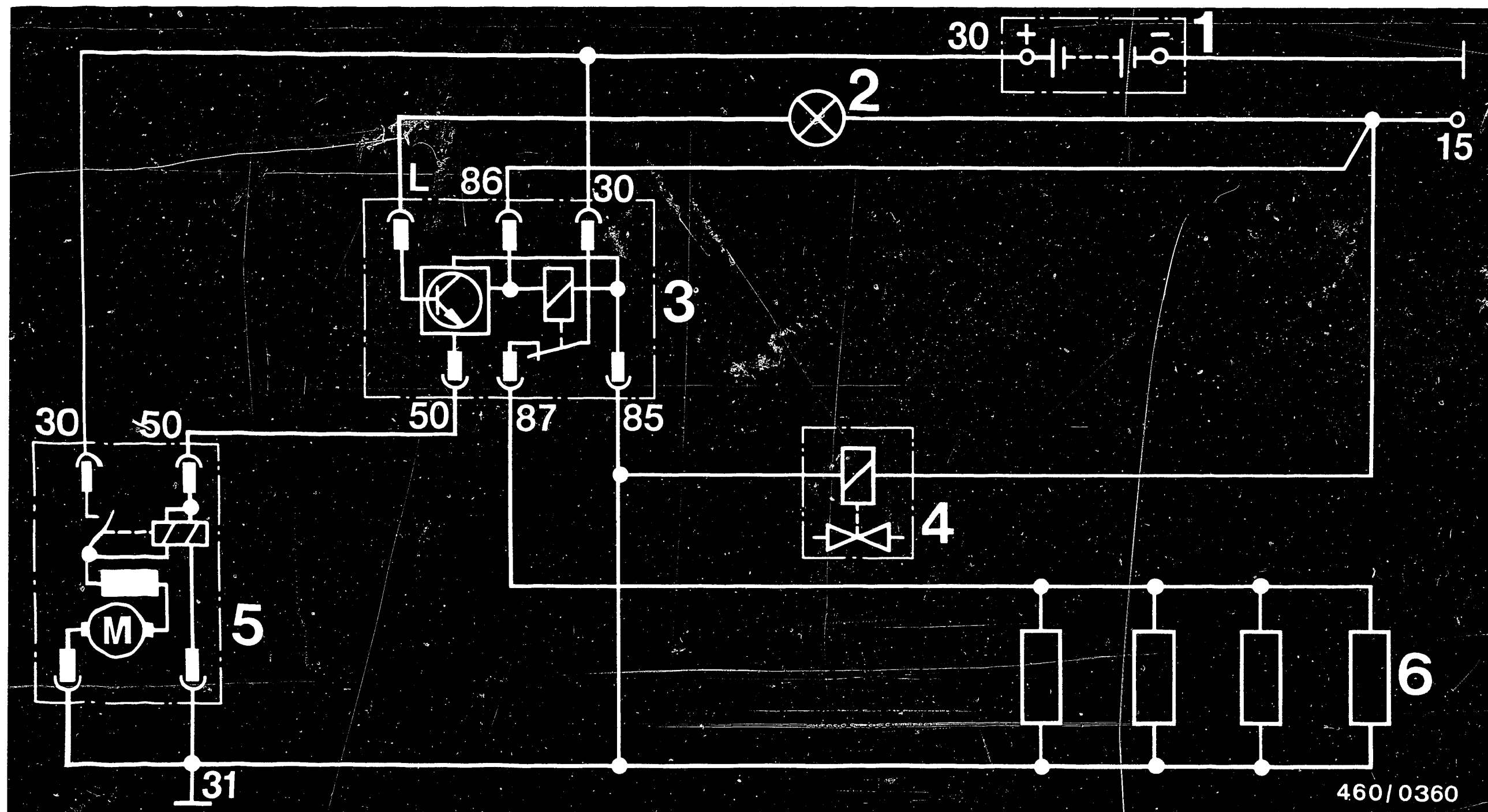
460/0021

- 1 = Differential-pressure gauge
- 2 = Filter outlet (use inlet union and extra-long inlet-union screw 2 443 456 020)
- 3 = Filter inlet (use inlet union and extra-long inlet-union screw 2 443 456 020)

### 3.2 Connection diagram for filter test

Connect differential-pressure gauge to fuel filter using appropriate connecting pieces.





460/0360

### 3.3 Terminal diagram for pre-heating system

1 = Battery  
2 = Visual indication

3 = Glow duration control unit  
4 = Solenoid-operated valve

5 = Starting motor  
6 = Sheathed-element glow plug

**A7**

Check pre-heating system  
Opel Ascona/Kadett-Diesel



**A8**

Check pre-heating system  
Opel Ascona/Kadett-Diesel



#### 4. Test equipment and tools

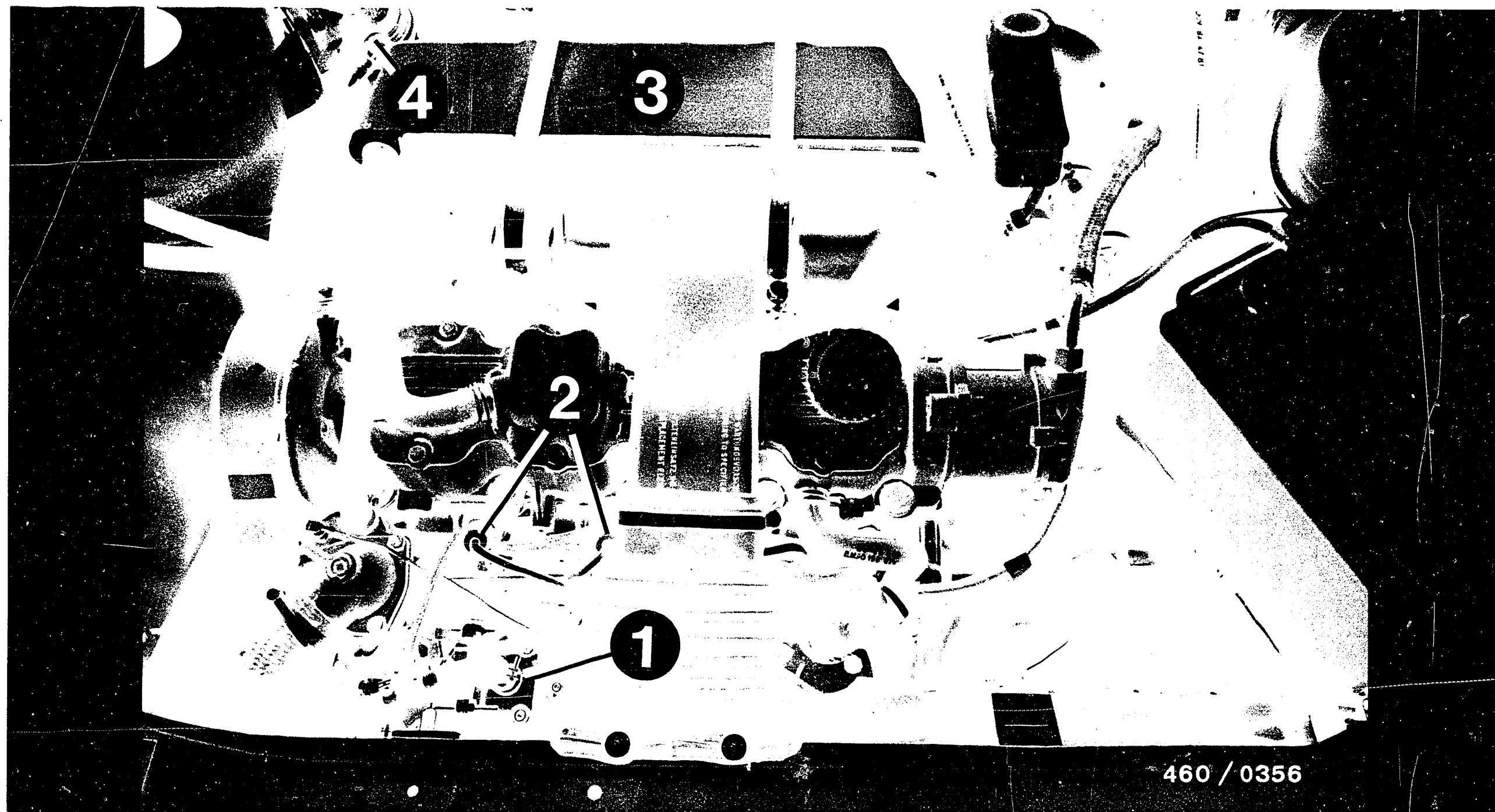
Designation	Part No.	Use
Puller flange	KDEP 1135	Removing injection pump gear
Holding device	KDEP 1134	Locking the camshaft
Open-end wrench	KDEP 1133	Swivelling water-pump housing
Toothed-belt tester	KDEP 1121	Testing tension of toothed belt
Box wrench	KDEP 1115	Loosening the fuel-injection tubing
Measuring tool Mini dial indicator 1/100 mm divisions	KDEP 1085 Commercially available e.g. Hahn & Kolb 7000 Stuttgart Part No. 33003 with adapter KDEP 1127	Injection timing Injection timing
Socket wrench 2745	Commercially available Hazet Co. Postfach 101067/68 5630 Remscheid 1	Removing and installing fuel inlet line



## Test equipment and tools (continued)

Designation	Part No.	Use
Nozzle tester	EFEP 60 H 0 681 200 502	Testing the injection nozzles
Compression tester	Commercially available	Testing the engine compression
Compression-loss tester	EFAW 210 A 0 681 001 901	Testing the engine compression loss
Tachometer	Commercially available	Setting the engine speed
Differential-pressure gauge	Commercially available e.g. Henni Co. NG160/311-911/ -1.0 + 4.0 bar Henni Nauheimer Str. 78-80 7000 Stuttgart 50	Filter test
Evaluating unit	0 684 102 050	Smoke test
Accessories box with sampling pump	0 681 169 038	
Measuring rail	KDEP 1155	Testing and setting the engine timing





# 5. Installation position of components

1 = Fuel-injection pump

2 = Injection nozzles

3 = Air-filter housing

4 = Fuel filter

**A11**

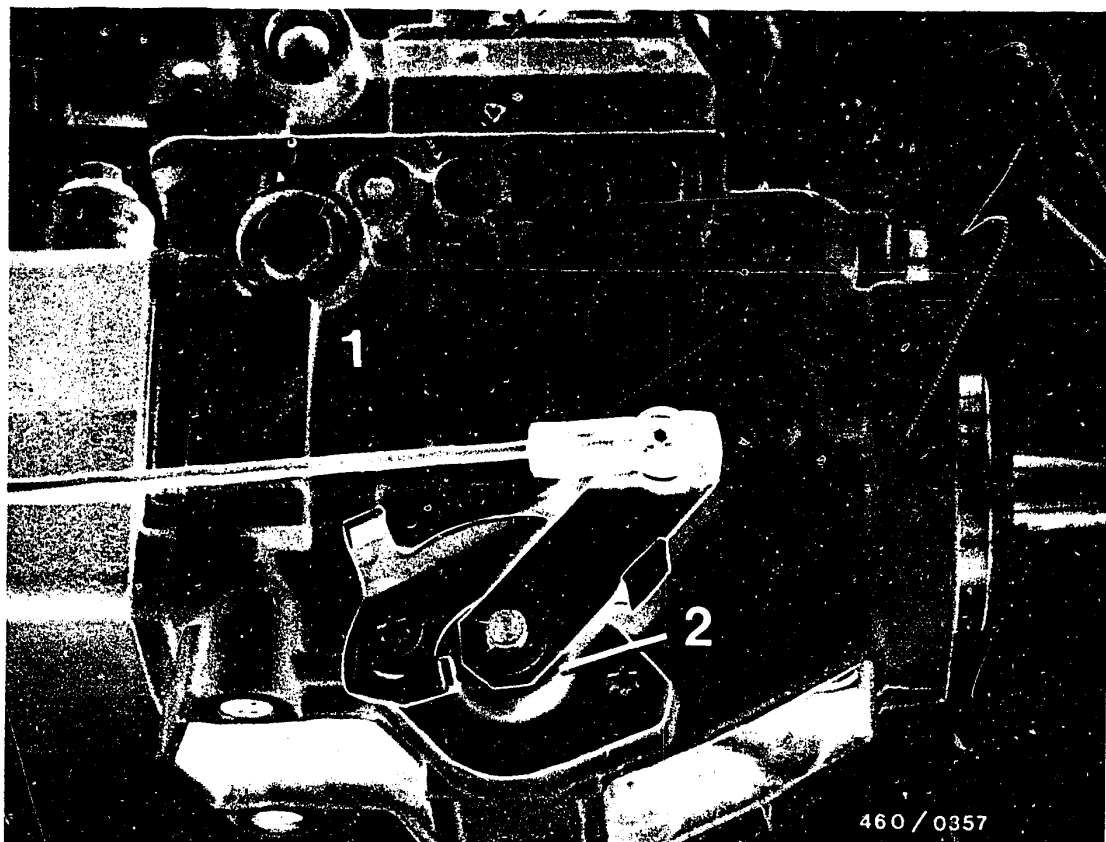
Installation position of components  
Opel Ascona/Kadett-Diesel



**A12**

Installation position of components  
Opel Ascona/Kadett-Diesel





- 1 = Fuel-injection pump  
2 = Cold-start accelerator (KSB)

The fuel-injection pump is not readily accessible.  
This picture shows the pump when removed.



# 6. Trouble-shooting chart Customer complaint (symptom)

1. Engine fails to start or starts only with great difficulty when warm.
2. Engine fails to start or starts only with great difficulty when cold.
3. Engine hunts when idling.
4. Erratic idling when engine is warm.
5. Engine misfires during vehicle operation
6. Unsatisfactory performance

						Cause (component fault)	Coordinates
•	•	•		•	•	Tank empty; tank vent clogged	B 5
				•		Cold-start accelerator not actuated	B 6
	•		•	•		Injection sequence does not correspond to firing sequence (check routing of fuel-injection tubing)	B 7
		•		•	•	Overflow restriction clogged	B 8
•	•					Shutoff device defective	B 9
			•	•	•	Air in fuel system	B 13
		•		•		Heavy paraffin deposits in filter under winter operation (replace filter box)	B 15
				•		Lines leaky or broken; connections loose	B 17
						Supply lines clogged (check fuel lines)	B 19
		•		•	•	Fuel-injection tubing clogged or constricted (check fuel lines)	B 20
		•		•		Engine air filter clogged	C 1
	•					Idle speed incorrect	C 9
			•			Injection nozzle defective	C 10
	•	•		•		Start of pump delivery incorrect	G 1
		•		•		Fuel filter clogged (check differential pressure)	C 15
	•	•				Timing device defective (remove fuel-injection pump)	D 3
				•		Engine compression poor or uneven	D 4
			•			Maximum speed incorrectly adjusted (remove fuel-injection pump)	D 15
•	•	•	•	•	•	Fuel-injection pump (governor) defective or out of adjustment (remove fuel-injection pump)	D 15

B1

Trouble-shooting chart  
Opel Ascona/Kadett-Diesel



B2

Trouble-shooting chart  
Opel Ascona/Kadett-Diesel





# Trouble-shooting chart (continued)

7. Excessive fuel consumption.

8. Engine cannot be switched off.

9. Engine runs rough, black smoke in full-load range; possibly lack of power.

10. Fog-like smoke in full-load range (white).

11. Incorrect engine speeds.

12. Engine will not rev up when cold.

13. Distributor-type fuel-injection pump becomes too hot.

Cause (component fault)

Coordinates

			•		•	Tank empty; tank vent clogged	B 5
					•	Cold-start accelerator not actuated	B 6
		•		•	•	Injection sequence does not correspond to firing sequence (check routing of fuel-injection tubing)	B 7
					• •	Overflow restriction clogged	B 8
	•					Shutoff device defective	B 9
			•		•	Air in fuel system	B 13
			•		•	Heavy paraffin deposits in filter under winter operation (replace filter box)	B 15
					•	Lines leaky or broken; connections loose	B 17
			•		•	Supply lines clogged (check fuel lines)	B 19
			•		•	Fuel-injection tubing clogged or constricted (check fuel lines)	B 20
		•	•		•	Engine air filter clogged	C 1
		•				Idle speed incorrect	C 9
				•		Injection nozzle defective	C 10
		•				Pre-heating system defective	C 18
•		•	•		•	Start of pump delivery incorrect	G 1
			•		•	Fuel filter clogged (check differential pressure)	C 15
		•	•			Timing device defective (remove fuel-injection pump)	D 3
•					•	Engine compression poor or uneven	D 4
				•		Maximum speed incorrectly adjusted (remove fuel-injection pump)	D 15
•	•	•	•	•	•	Fuel-injection pump (governor) defective or out of adjustment (remove fuel-injection pump)	D 15

**B3**

Trouble-shooting chart  
Opel Ascona/Kadett-Diesel



**B4**

Trouble-shooting chart  
Opel Ascona/Kadett-Diesel



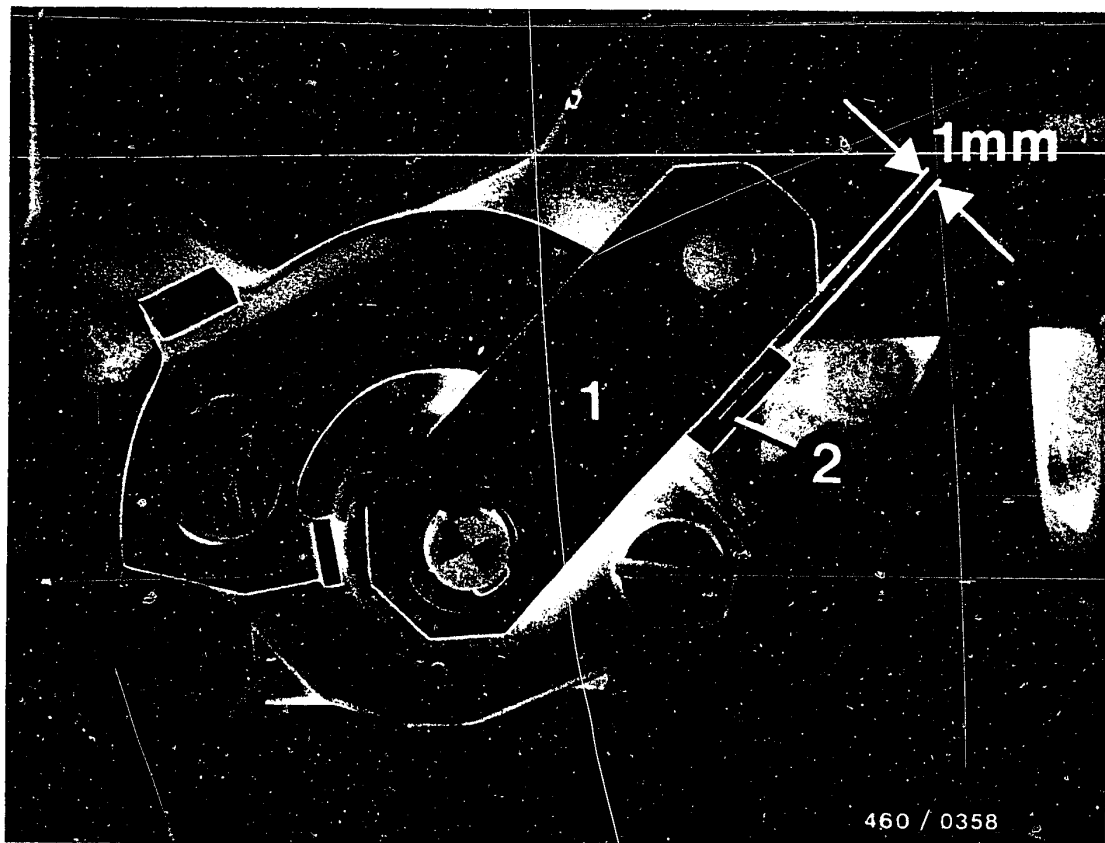
## 7. Check tank vent

Open filler cap.

If the fault disappears after opening the filler cap, the tank vent is defective.

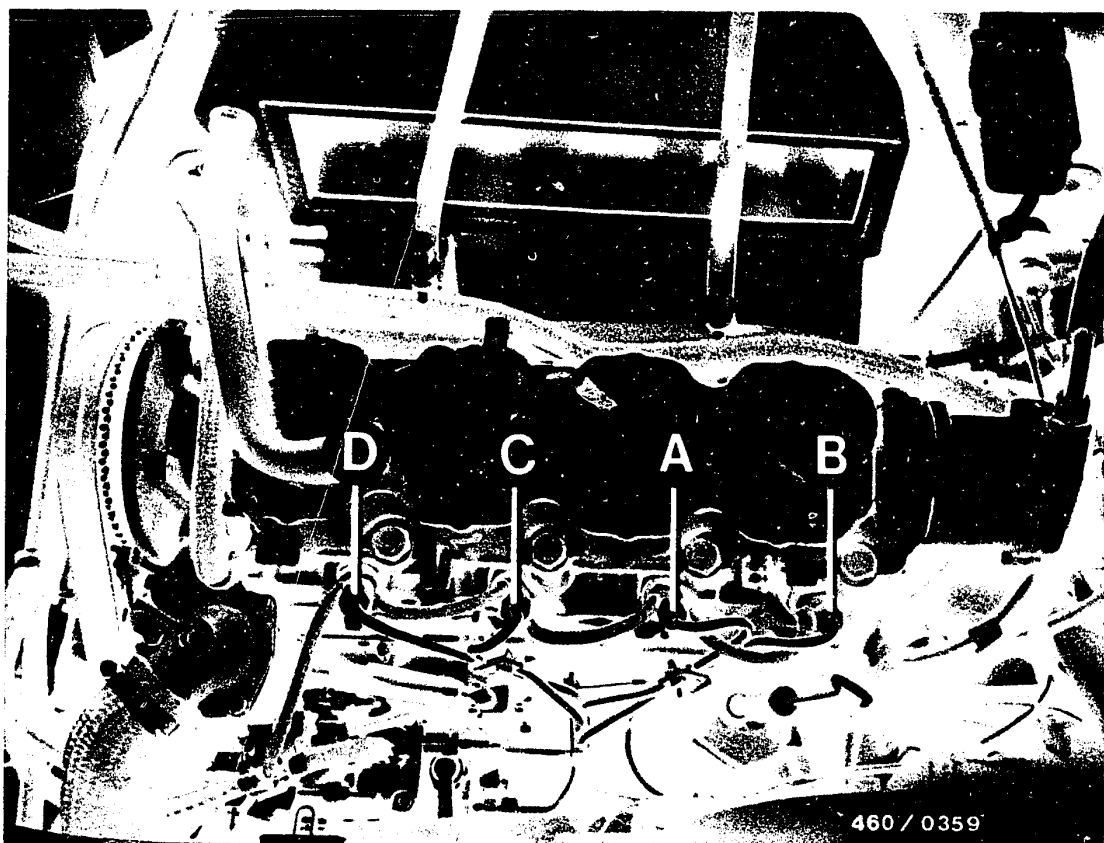
Check the tank vent for clogging.





#### 8. Test operation of cold-start accelerator (KSB)

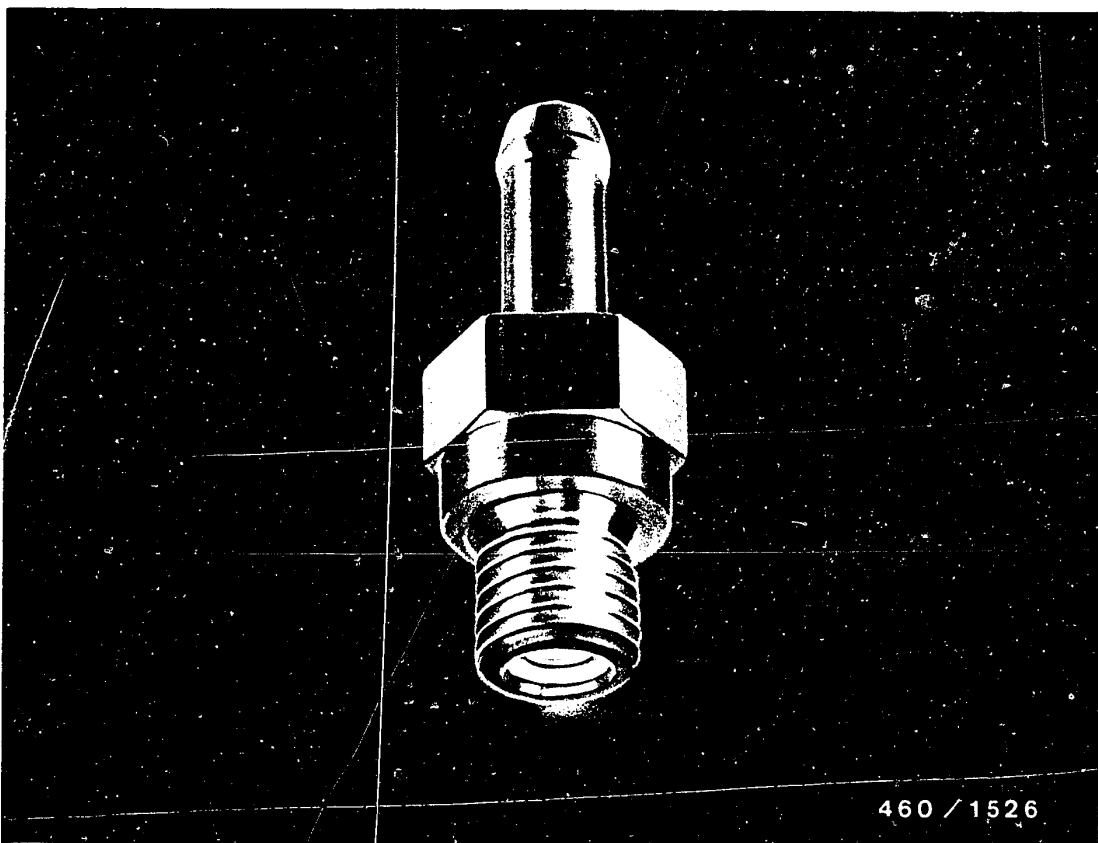
Check whether, with the cold-start accelerator not pulled, there is a gap of 1 mm between stop lever (1) and stop plate (2).



### 9. Check routing of fuel-injection tubing

The individual fuel-injection lines are held together by clamps so that it is impossible for the outlets to be mixed up. If, however, there is any doubt, check the routing of the lines as shown in the picture above. The pairing of the fuel-injection pump outlets with the individual engine cylinders is identified by the letters A - D.





#### 10. Check overflow restriction

Unscrew overflow restriction on fuel-injection pump (overflow restriction not marked "out"). Perform visual check of wire screen for impurities. If in doubt, replace overflow restriction.

#### Caution:

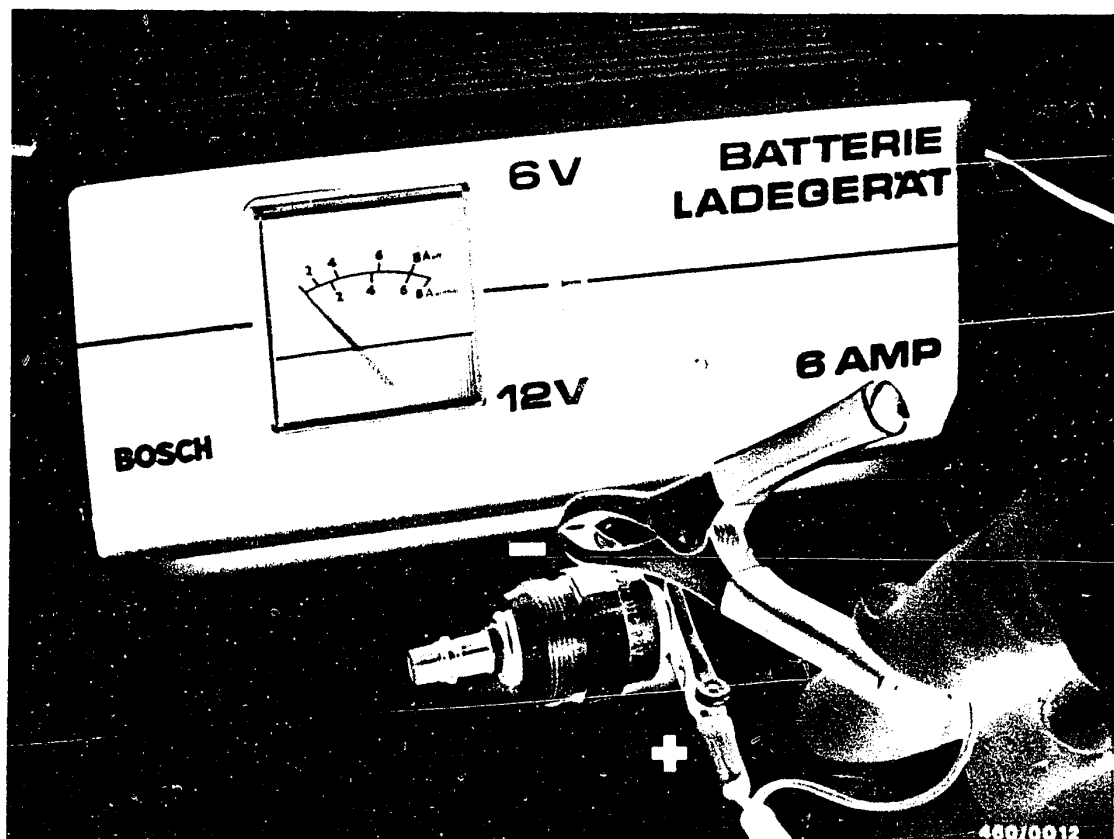
Before testing and setting the distributor-type fuel-injection pump, remove overflow restriction (Opel part). Screw in overflow restriction 1 683 456 303 marked with "Out" and check distributor-type fuel-injection pump. After testing is completed, remove overflow restriction 1 683 456 303 and remount overflow restriction (Opel part).

**B8**

Check overflow restriction

Opel Ascona/Kadett-Diesel





## 11. Check operation of shutoff device

### 11.1 Engine fails to start

Check whether solenoid-operated valve is supplied with voltage (min. 10 V) with glow-plug and starter switch switched on (drive position).

If voltage is present, remove fuel-injection tubing and take out solenoid-operated valve.

Cleanliness is essential.

When removed, check operation of solenoid-operated valve.

#### Note:

When removed, the solenoid-operated valve must only be supplied with voltage for a short period of time since it is no longer being cooled by the fuel.



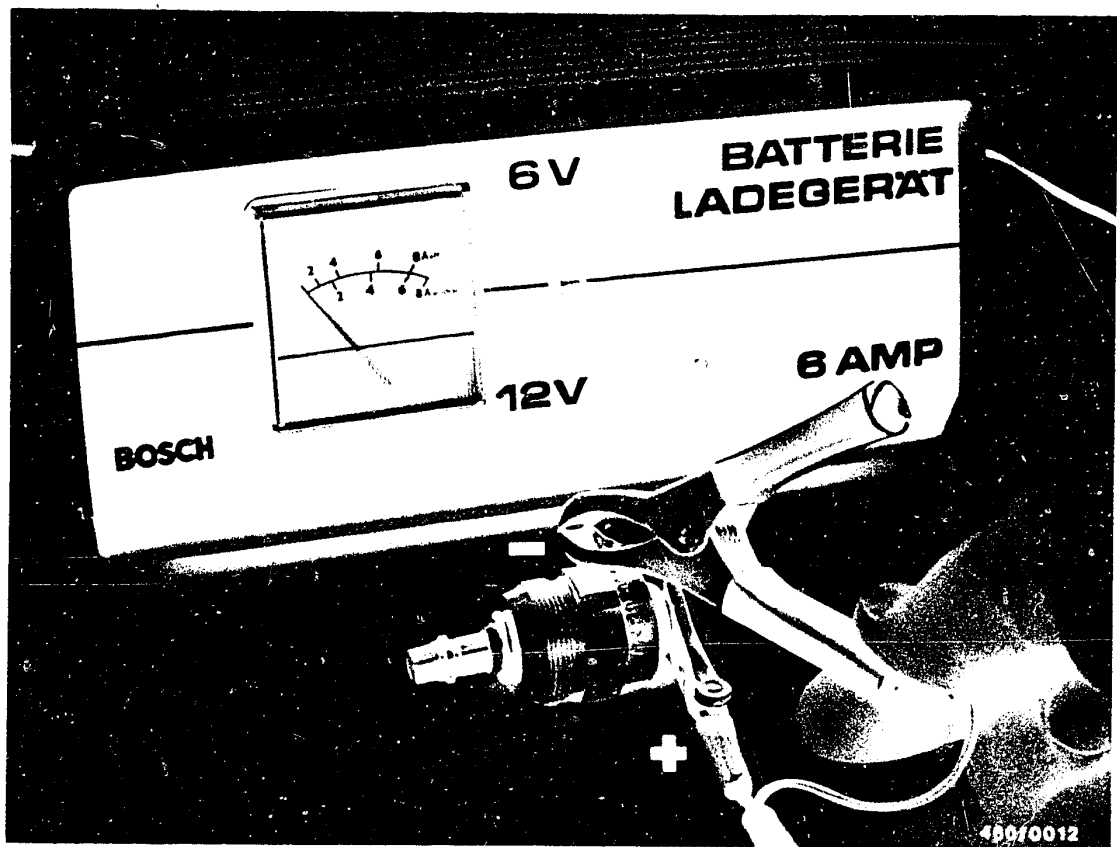
## 11.2 Engine cannot be switched off

With the glow-plug and starter switch in the stop position there must be no voltage across the solenoid-operated valve, i.e. the fuel inlet to the distributor-pump plunger is interrupted.

If the engine runs on, although there is no voltage across the solenoid-operated valve, the engine can be switched off as follows:

select 3rd or 4th gear. Jam on footbrake and let out the clutch.





### 11.2.1 Solenoid-operated valve test

Remove fuel-injection tubing.  
Take out solenoid-operated valve.  
Cleanliness is essential.

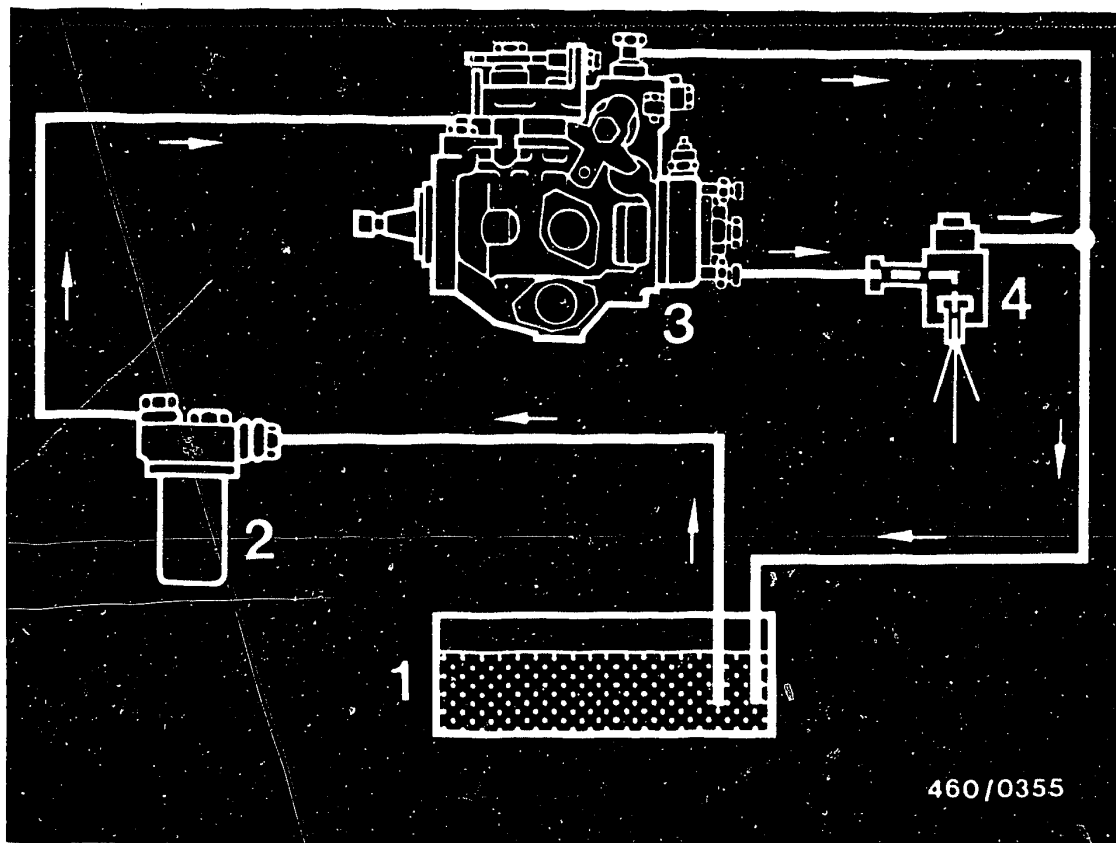
When removed, check operation of solenoid-operated valve.

#### Note:

When removed, the solenoid-operated valve must only be supplied with voltage for a short period of time since it is no longer being cooled by the fuel.  
Check valve seat in hydraulic head (visual inspection).







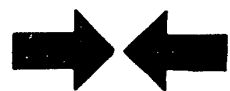
460/0355

- 1 = Fuel tank
- 2 = Fuel filter
- 3 = Distributor-type fuel-injection pump
- 4 = Injection nozzles

## 12. Connection diagram of fuel lines

The fuel lines are connected as shown in the above diagram.

The fuel flows in the direction of the arrows.





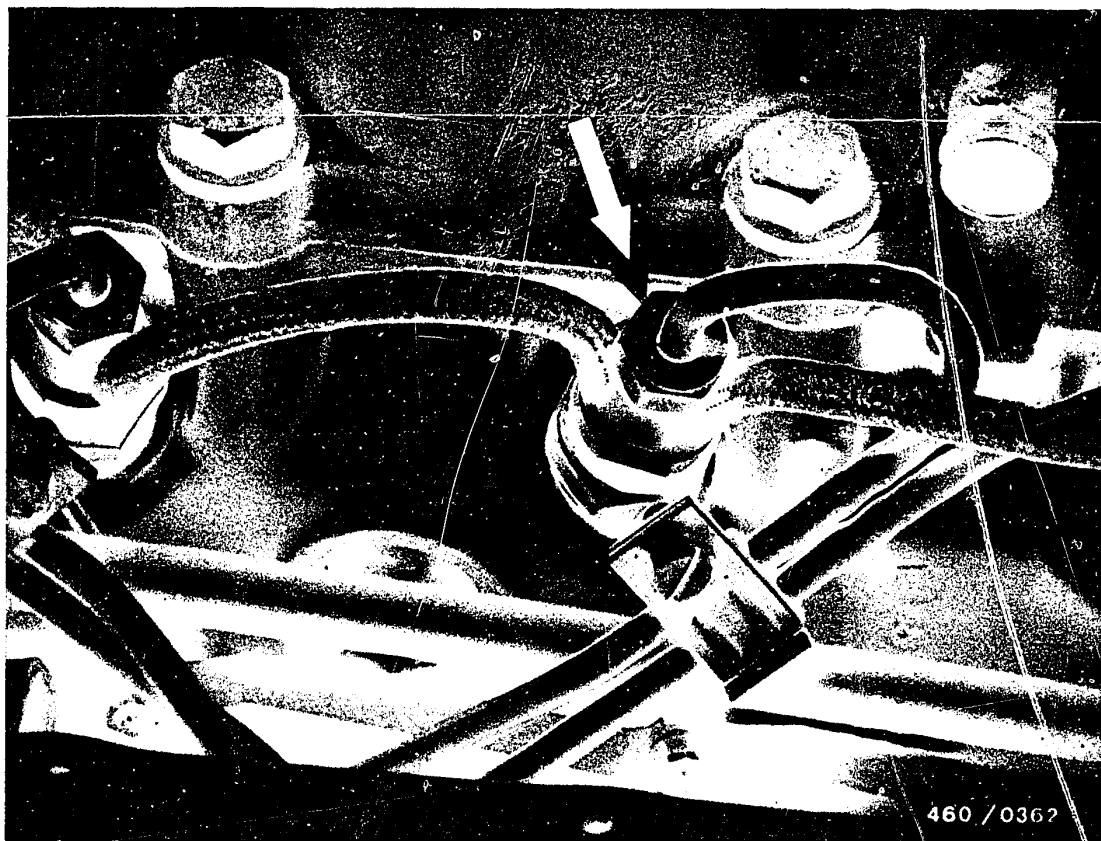
### 13. Bleed fuel system

Fill up fuel filter and fuel-injection pump with diesel fuel.

Close bleeder screw on fuel filter (picture a, arrow).

Loosen bleeder screw on fuel-injection pump and unscrew by a few turns (picture b, arrow - view from below).





Loosen union nuts (arrow) of fuel-injection tubing on nozzle-holder assemblies.

Actuate starting motor without pre-heating. When the fuel escaping from the bleeder hole in the injection pump is free of bubbles tighten the bleeder screw.

Continue to actuate starting motor until fuel escapes at union nuts of nozzle-holder assemblies. Tighten union nuts.

Actuate starting motor until engine starts.





## 14. Replace and drain filter box

### 14.1 Replace filter box

Unscrew fuel filter from the filter cover.  
If stuck, loosen filter box with special wrench, e.g. Matra W 167. Catch escaping fuel.





Rub diesel fuel into the rubber seal (arrow) of the new filter box.

Screw the filter box into the cover by hand and tighten.

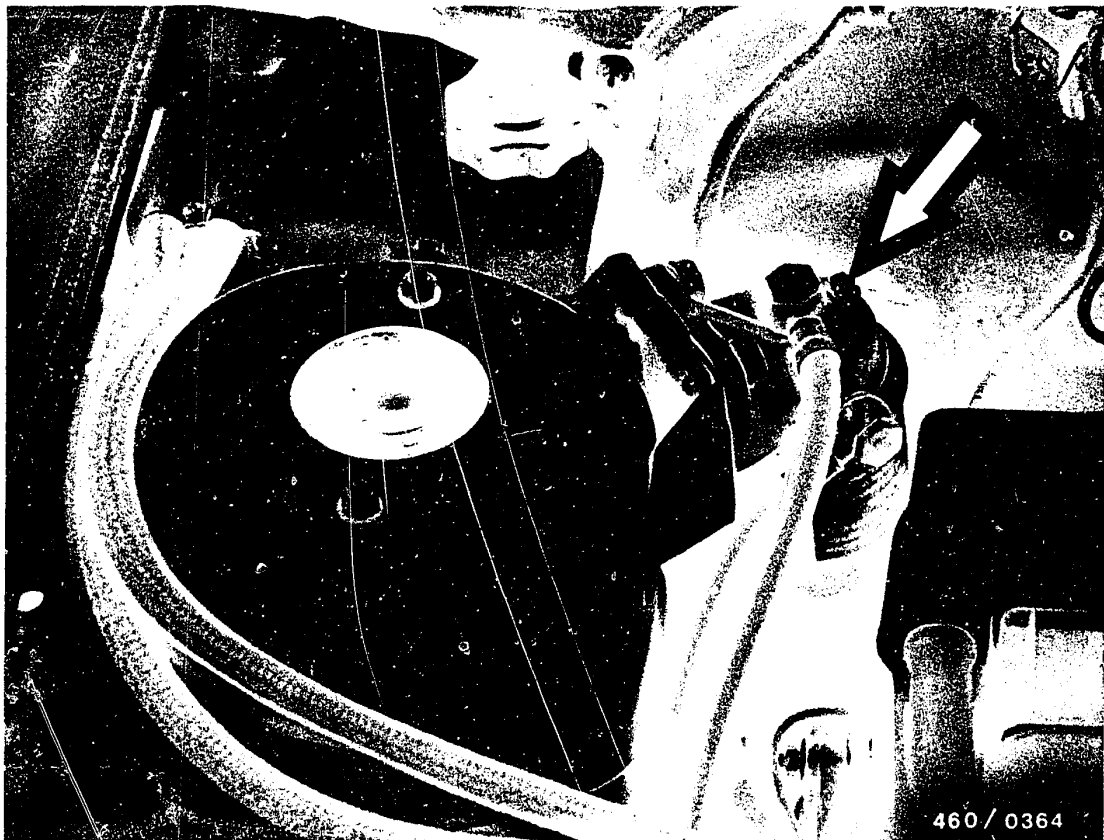
Check the fuel filter for leaks.

In the case of winter fuel it may be necessary to add petroleum as specified by the vehicle manufacturer.

**B 16**

Replace and drain filter box  
Opel Ascona/Kadett-Diesel





#### 14.2 Drain water from fuel filter

Loosen bleeder screw (arrow) on the filter cover by a few turns.

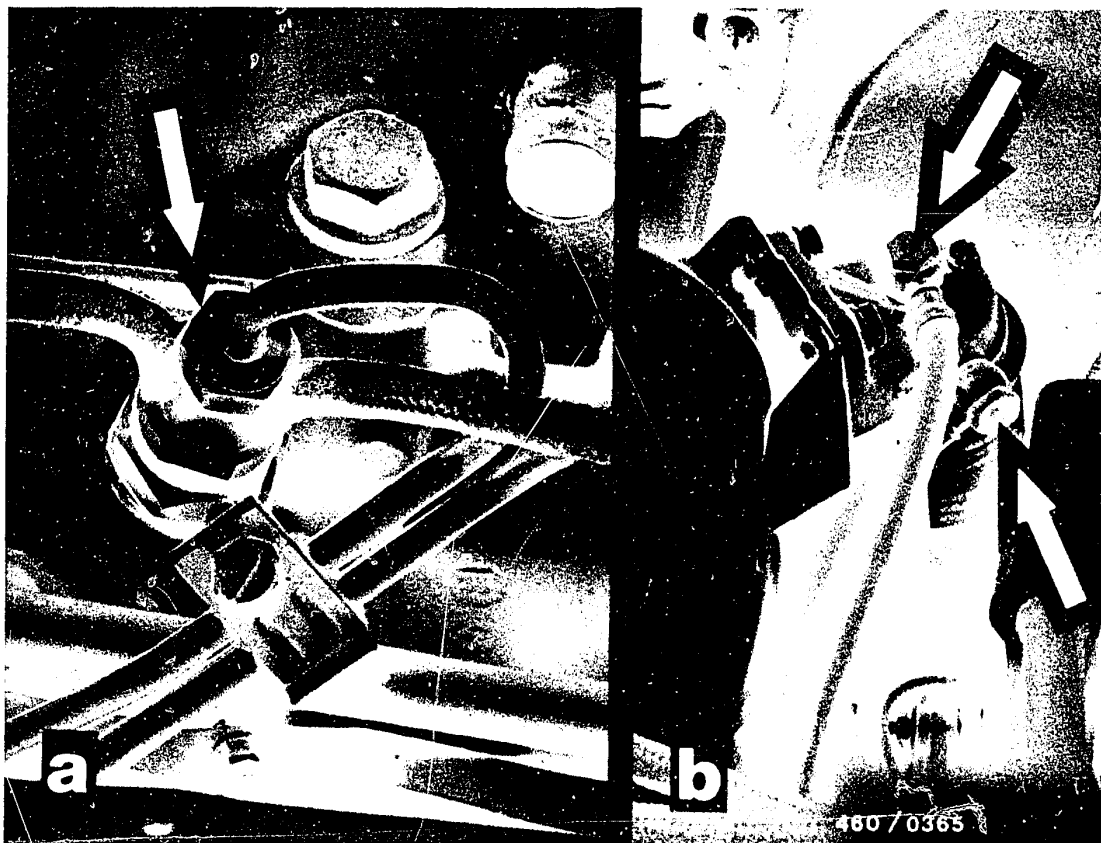
Loosen water-drain screw on the base of the filter and drain water.

Catch liquid in container.

Tighten water-drain screw and bleeder screw and check for leaks.

If necessary, bleed fuel filter.





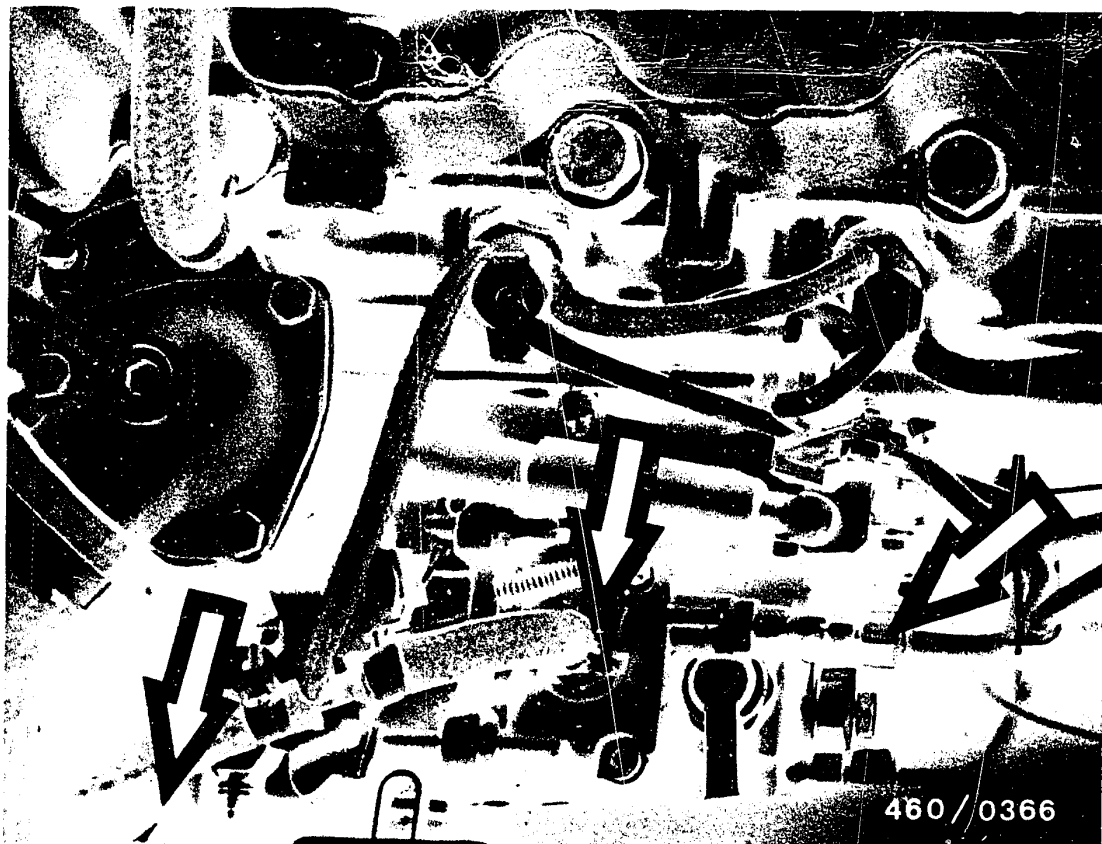
### 15. Check fuel-injection system for leaks

Perform leak test with engine at normal operating temperature.

During leak test, check all fuel line connection points. Pay particular attention to:

- Connections on nozzle-holder assemblies (Fig. a)
- Connections on fuel filter (Fig. b)





- Inlet and return lines on distributor-type fuel-injection pump
- Delivery-valve holders on hydraulic head

Perform visual inspection of fuel lines for hairline cracks.







#### 16. Check fuel lines

Subject suspect fuel lines to a visual inspection.

If there is no detectable pinching or kinking, the fuel line in question must be removed.

Check fuel line for throughflow using compressed air and clean if necessary.

A suitable hose piece may be used as a side seal for blowing out the fuel lines.



## 17. Smoke test - check air filter

### 17.1 Smoke test

Summary of the contents of the legal regulations (as at April 1978). Applicable to Federal Republic of Germany.

This regulation applies only to the homologation of motor vehicles, having at least 4 wheels with a maximum permissible speed of more than 25 km/h. A smoke emission test is not prescribed for official general inspections.

Parts which may have an influence on environmental pollution must be designed in such a way that the legal requirements are met during operation and despite vehicle vibration.

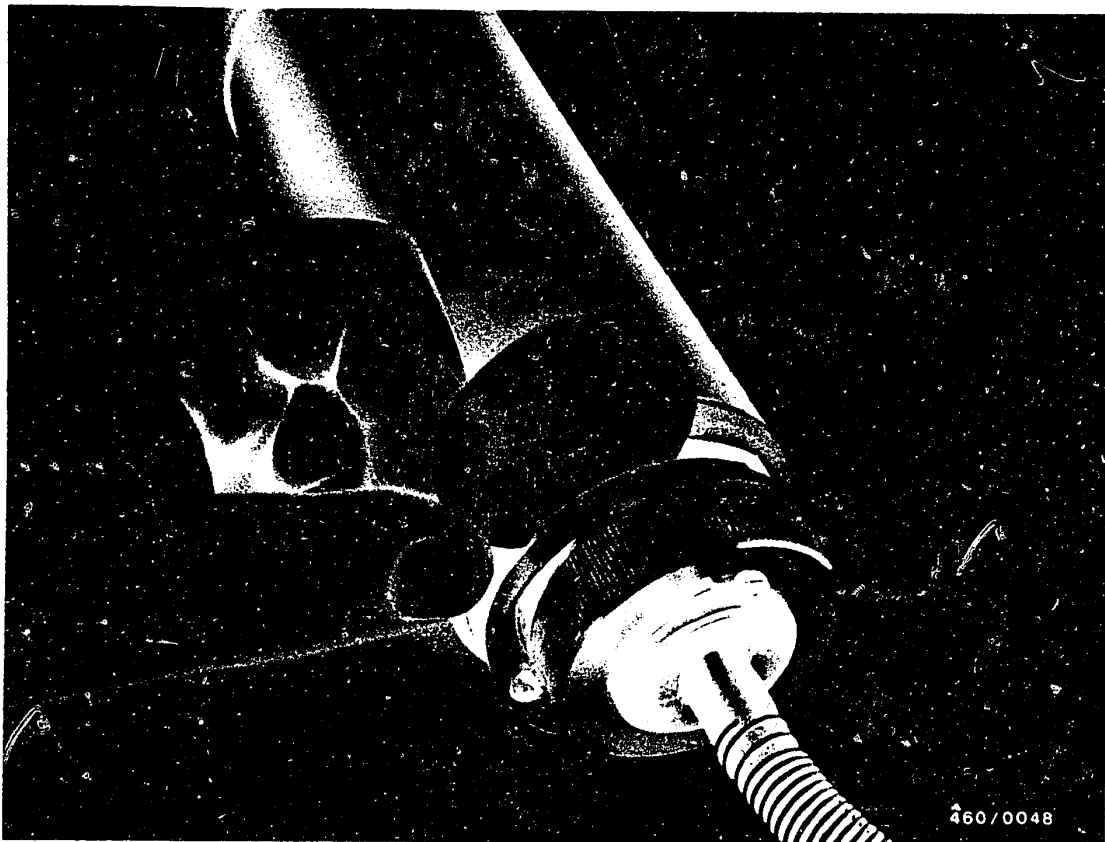
This applies in particular to cold-start devices and full-load stops. The Rheinland-Westfälische TÜV (Technical Inspection Bureau of Rhineland-Westfalia) in Essen is the sole approval agency.

**C1**

Smoke test

Opel Ascona/Kadett-Diesel





### 17.1.1 Test setup

The smoke test is conducted using the Bosch filter-type smokemeter.

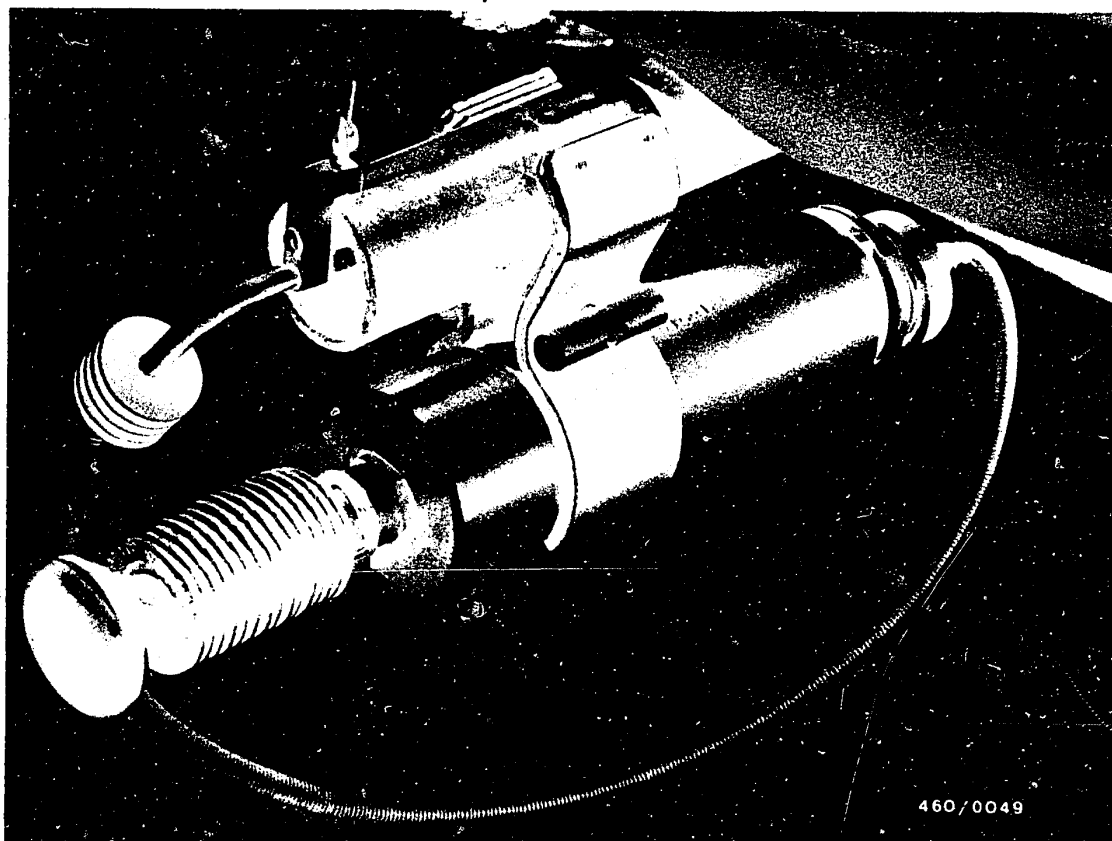
The filter-type smokemeter consists of the following units:

Accessories box with proportioning pump	0 681 169 038
---	---------------

Evaluating unit	0 681 169 039
-----------------	---------------

Insert filter plate into proportioning pump.

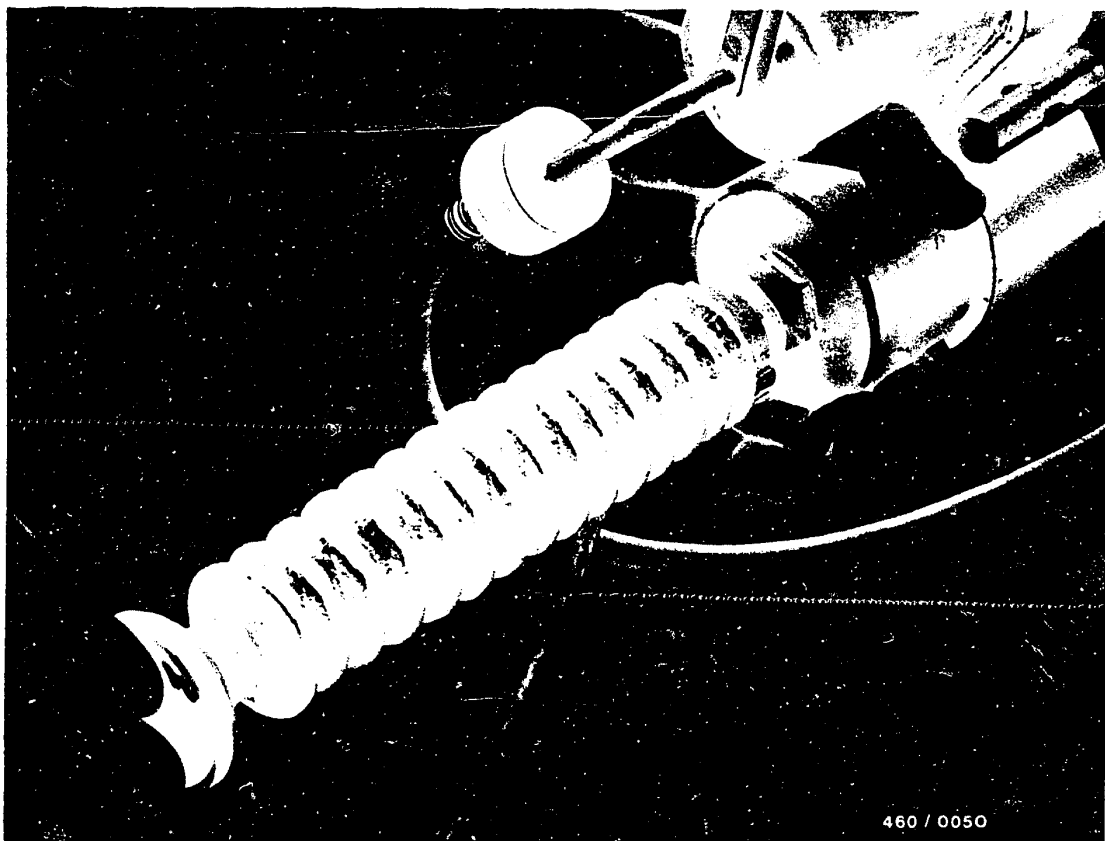




Mount sampling pump on exhaust pipe using appropriate clamp.

Introduce exhaust-sample pickup as far as possible into exhaust pipe and clamp in position.





### 17.1.2 Test procedure

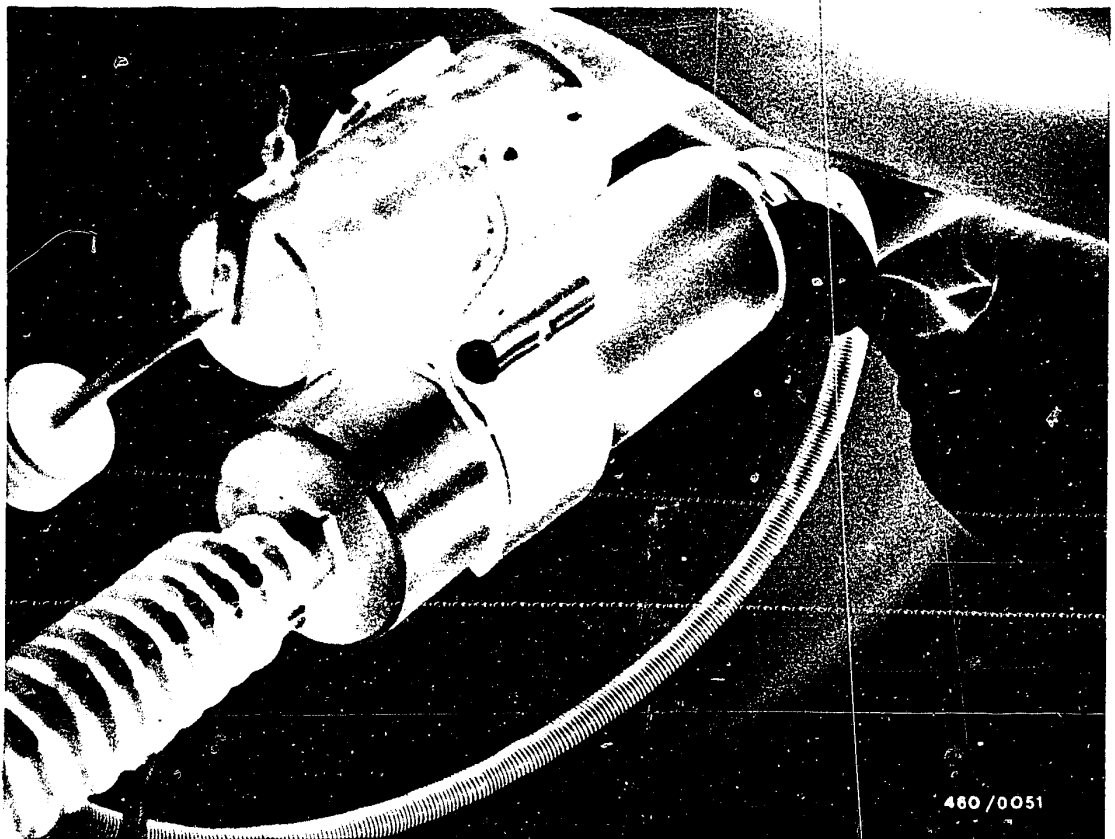
Set proportioning pump by pressing in the black push-button.

Take rubber ball on triggering hose and enter passenger compartment.

The test can be performed on the chassis dynamometer or on the road (gradient).

The chassis dynamometer is preferable in any case. Find the gear in which, with the accelerator pedal in the full-load position, a speed of approx. 40 km/h is reached. Load the engine so that, with the accelerator in the same position, a speed of approx. 25 km/h is reached.





Maintain this load condition for 5 seconds and then trigger the sampling pump by pressing the rubber ball.

Switch off engine.

**Caution!**

During the following operation, pay attention to the fact that the exhaust pipe has been heated due to the running of the engine.

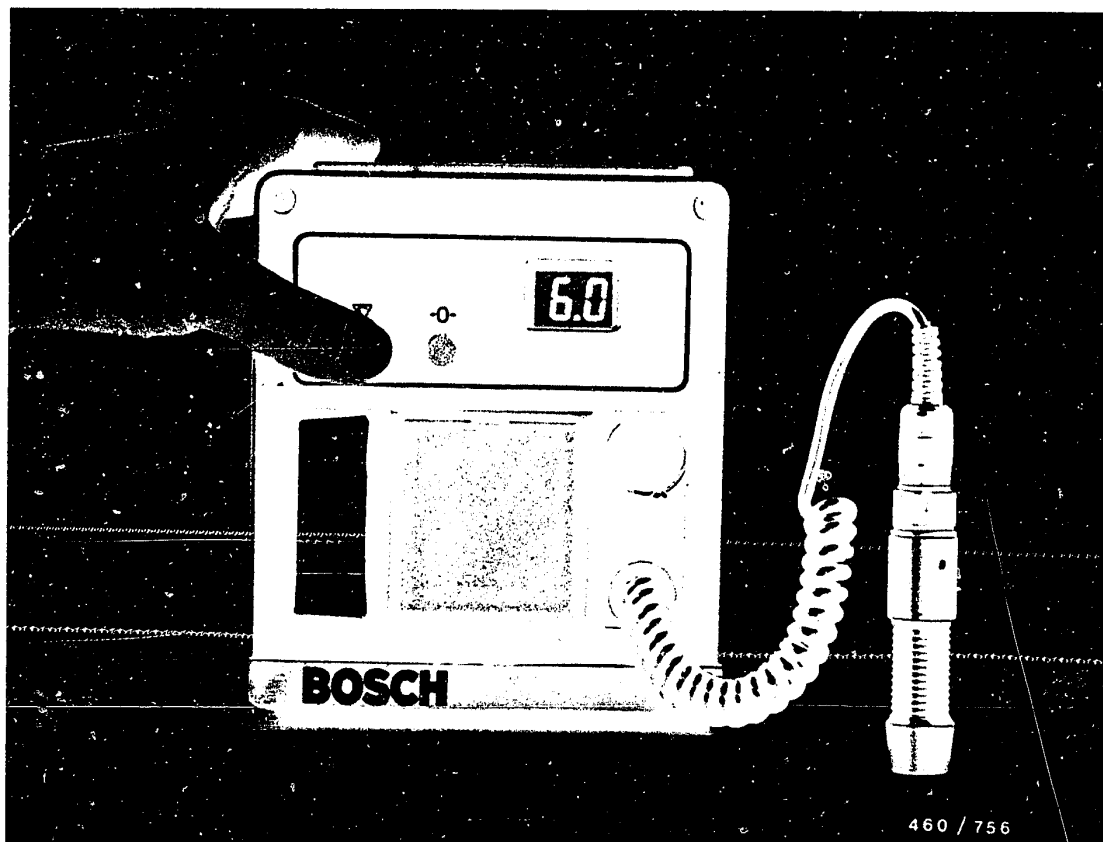
Remove filter plate from sampling pump.

**C5**

Smoke test

Opel Ascona/Kadett-Diesel





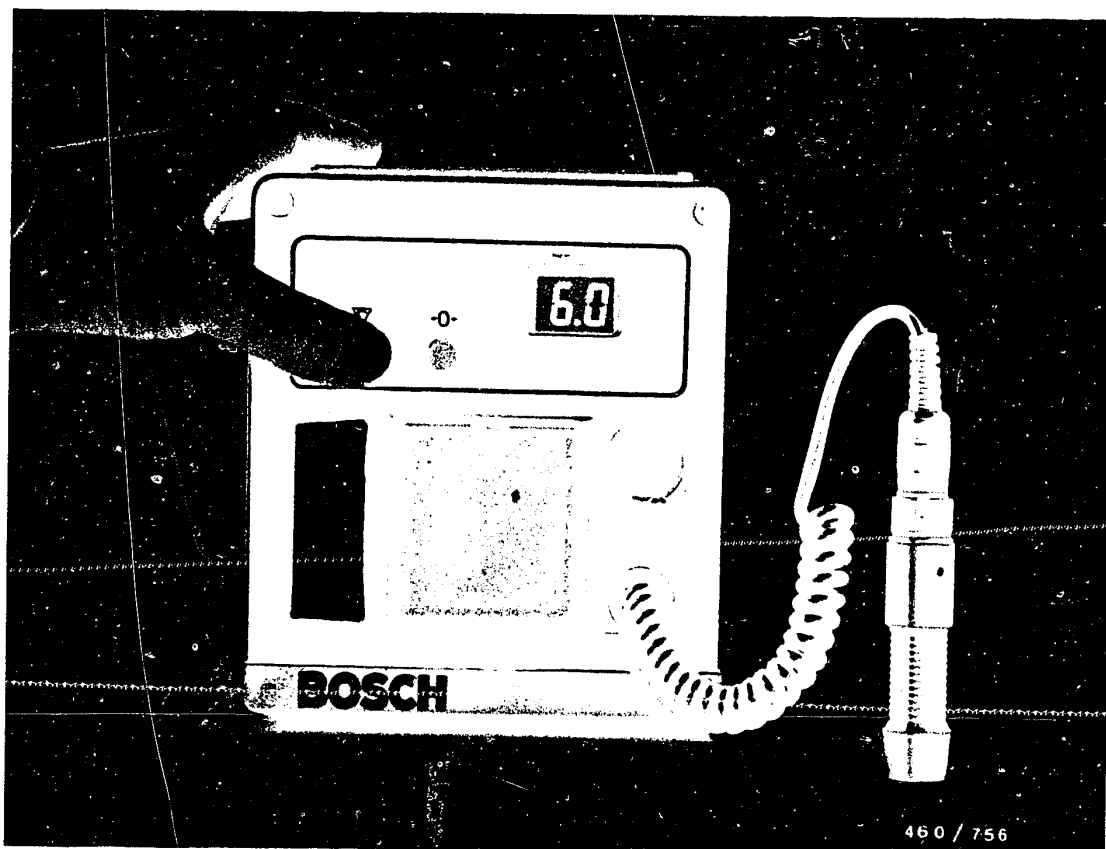
### Setting the Zero Point

The zero point adjustment must be performed

- before each measurement series
- if there are changes in ambient conditions
- each time the lens of the photo-element adapter has been cleaned.

Firmly press the measuring head of the photo-element adapter onto 5 clean, white filter plates placed one on top of the other.

Press button "0" until display 0.0 appears.  
Release button "0".



### Measuring

With the sooted side at the top, lay filter plate from metering unit on 3 new filter plates placed one on top of the other.

Press measuring head vertically on to black surface of filter plate. At the same time, press button "C" until smoke number appears in display.

### Note:

Measuring head must be firmly mounted both for the zero point adjustment and for measuring (even slight tilting may lead to incorrect measurements).

Compare the smoke number with the evaluation sheet.  
Note kW (HP) information of vehicle manufacturer.

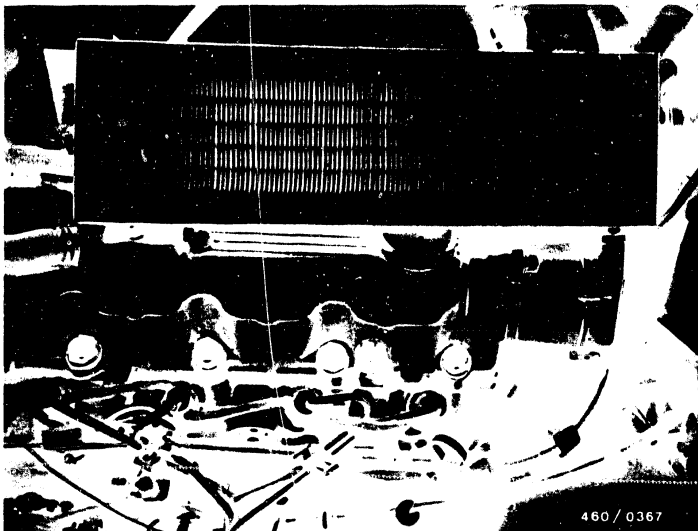
**C7**

Smoke test

Opel Ascona/Kadett-Diesel







### 17.2 Check air filter

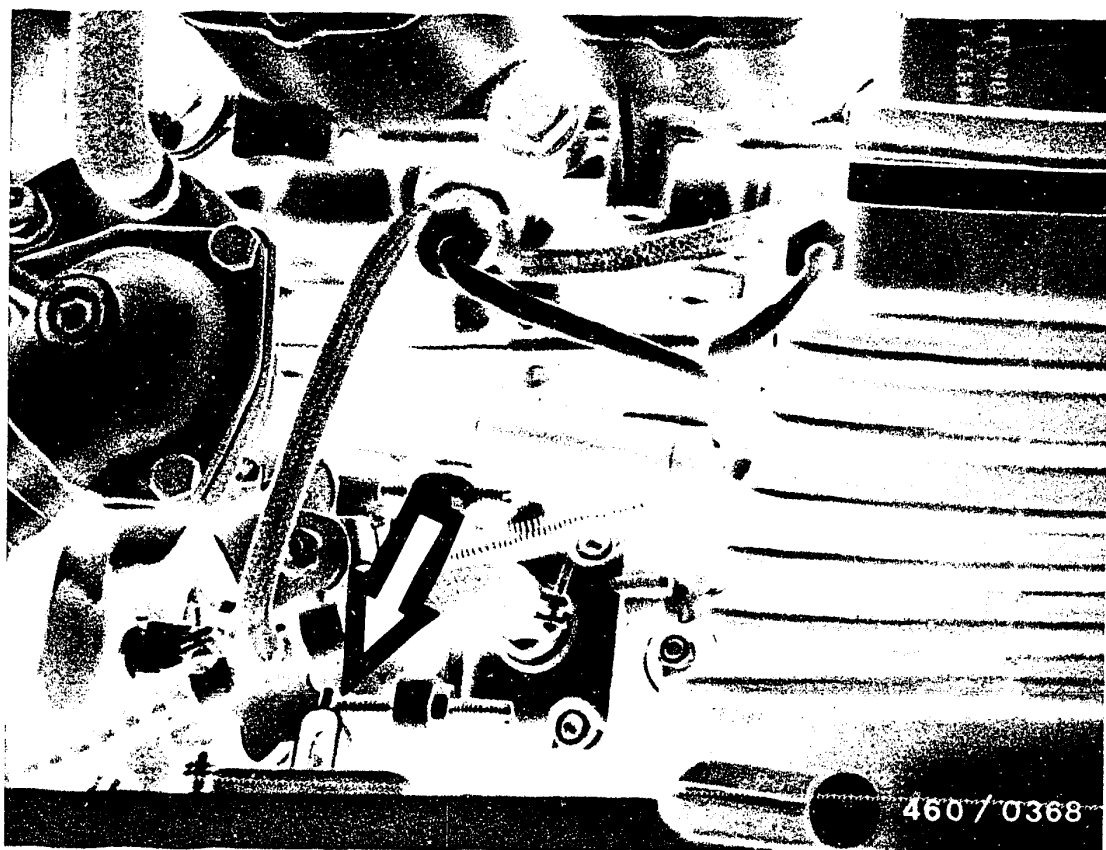
Remove air filter and subject to a visual inspection.

#### Test criteria for air filter:

- Dusty air filter (test by knocking out air filter)
- Oiled-up air filter
- Solid matter in air filter, e.g. leaves

If in doubt, use new filter element.





## 18. Adjust idle speed

Connect tachometer (e. g. photoelectric) to engine.  
Start engine and run at idle speed.

### Caution:

In order to adjust the idle speed the engine must be  
at normal operating temperature.

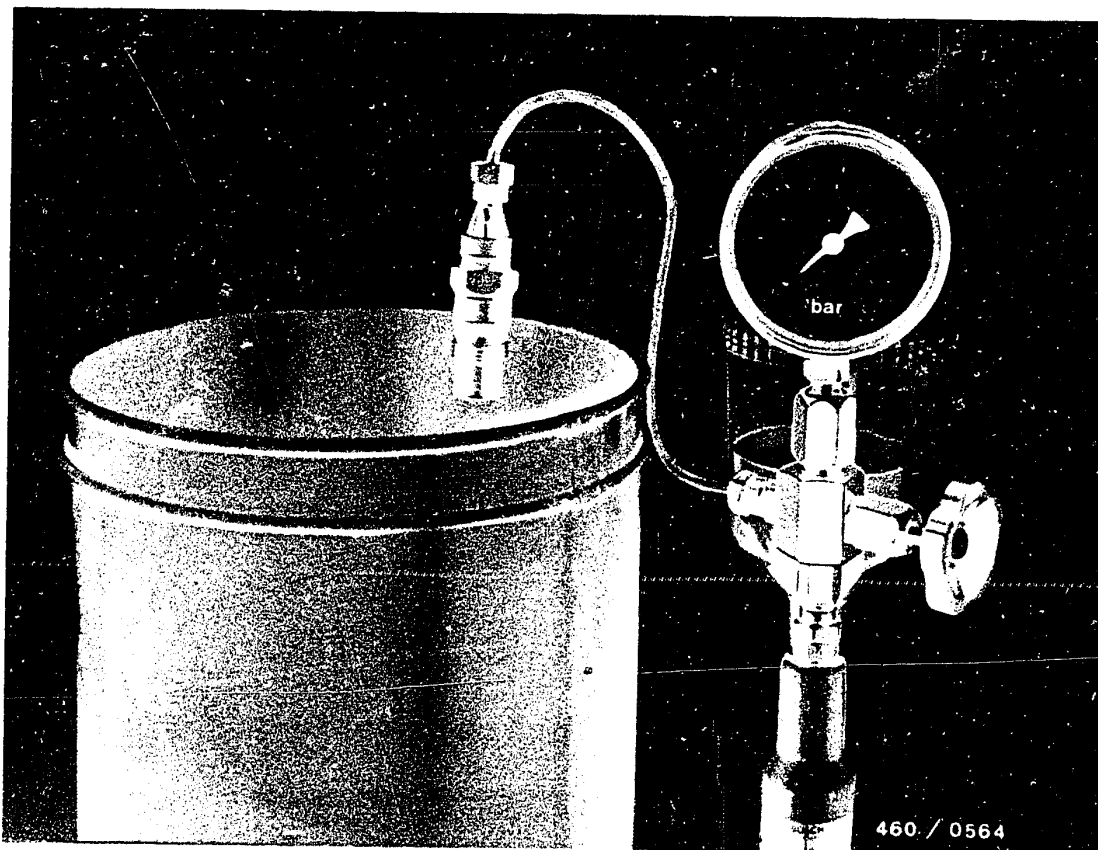
Coolant temperature 80°C.

Set engine speed at idle-speed-adjusting screw (arrow)  
to  $850 \pm 25 \text{ min}^{-1}$ .

Note that the camshaft and the injection pump are driven  
at half the engine speed.

After adjusting, lock and seal the adjusting screw.





### 19. Test injection nozzles

Remove injection nozzles.

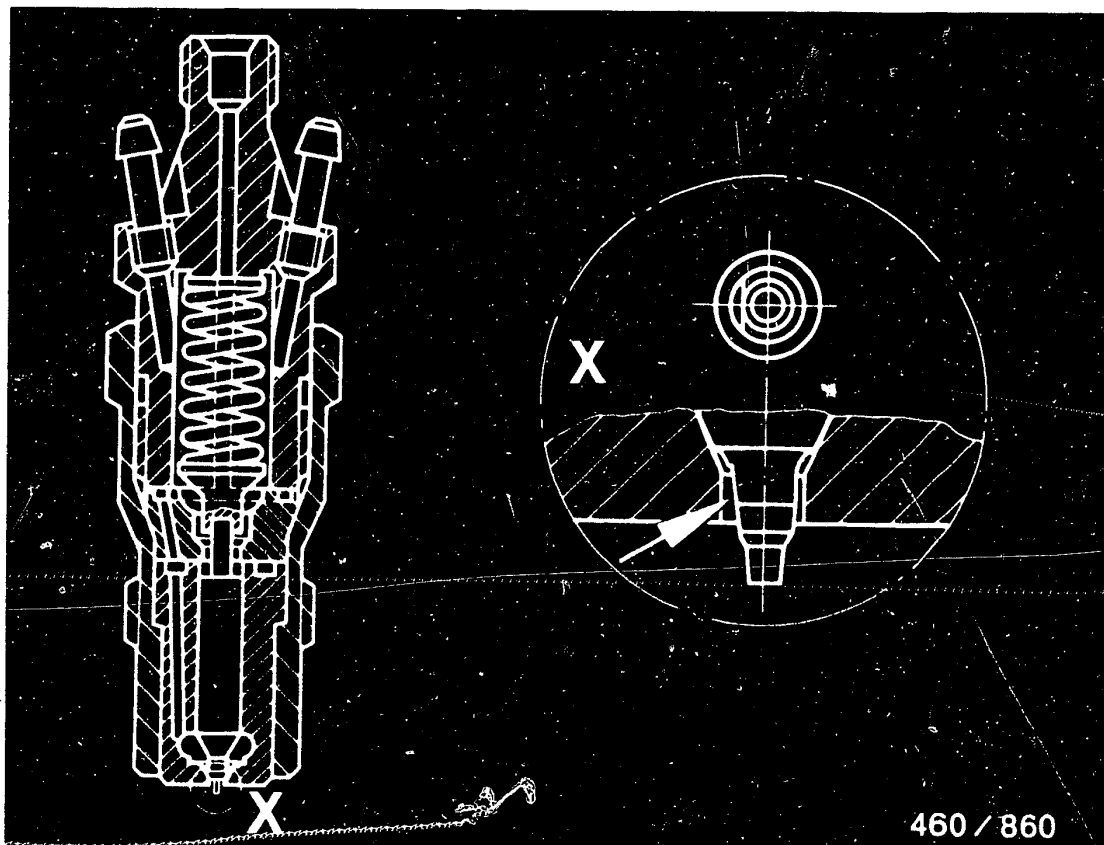
The test is performed using the nozzle tester EFEP 60 H  
0 681 200 502.

Mount injection nozzle with nozzle-holder assembly on  
nozzle tester.

#### Caution:

When testing injection nozzles, make sure that the fuel  
spray does not strike your hands since, due to the high  
pressure, the fuel will penetrate into the skin and may  
cause blood poisoning.





Vehicles as from 9.85 are equipped with flat-type pintle nozzles. They differ from pintle nozzles in that they have a flat on at the throttling pintle (see figure, arrow).

## Testing of flat-type pintle nozzles

### 19.1 Chatter test

Pressure gauge is switched off. Slowly move lever. The nozzle must then chatter; likewise when lever is jerked or moved quickly (4...6 downward movements/sec.).

When the lever speed is increased, a range is reached in which the nozzle does not chatter.

In this chatterless range, the test oil may escape as a cord-like spray.

#### Note:

Chattering indicates that movement of the needle valve is not restricted and that the nozzle seat and guide are mechanically perfect.

The shape of the spray in the chatter test is not important.

### 19.2 Check injection pressure

Switch on pressure gauge.

Slowly force lever downwards. When nozzle begins to squirt, read off injection pressure.

In the case of deviations from the set value, the nozzle-opening pressure must be adjusted by shims behind the pressure spring in the nozzle-holder assembly.

Set value: 135 + 8 bar

thicker shims = higher nozzle-opening pressure

thinner shims = lower nozzle-opening pressure

± 0.05 mm for the shims causes approx. 5.0 bar pressure difference.

#### Note:

When assembling the injection nozzle, comply with tightening torque of 70 to 90 Nm.

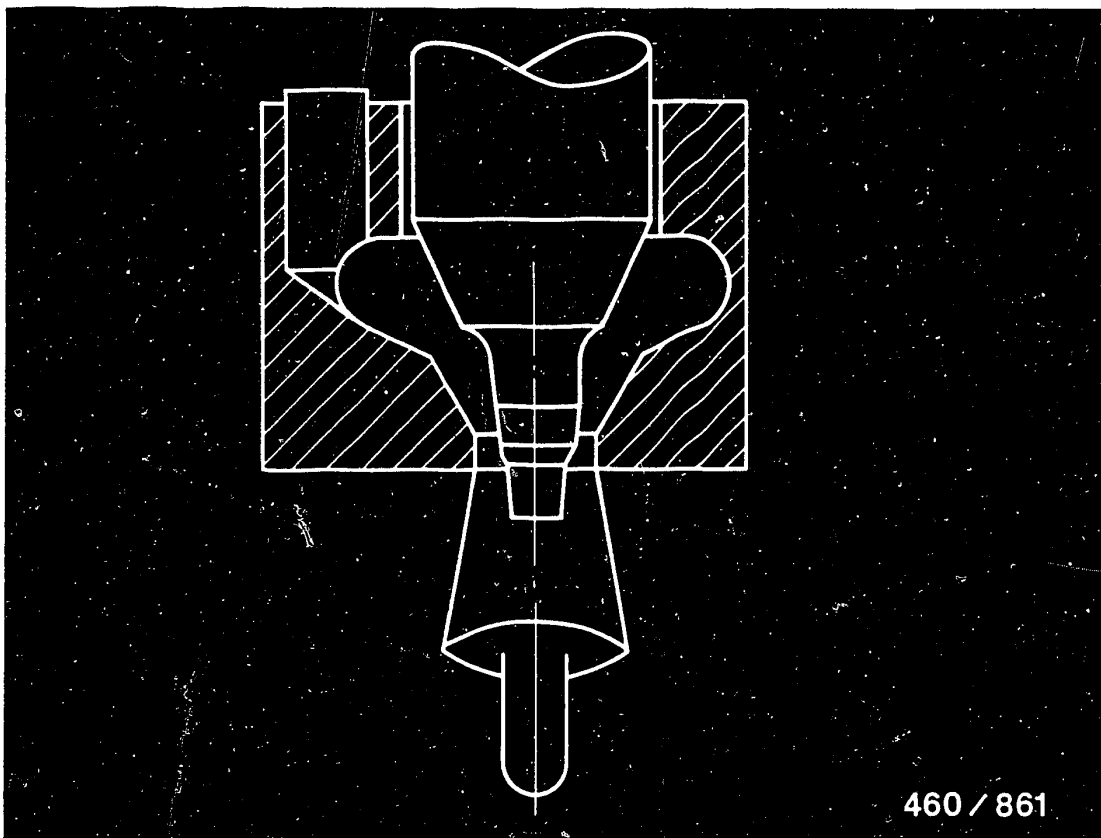
If the tightening torque is exceeded, the needle valve may stick.

### 19.3 Leak test

Switch on pressure gauge.

Slowly force lever downwards and maintain pressure approx. 20 bar below the opening pressure for 10 seconds. The nozzle must not drip during this procedure.





460 / 861

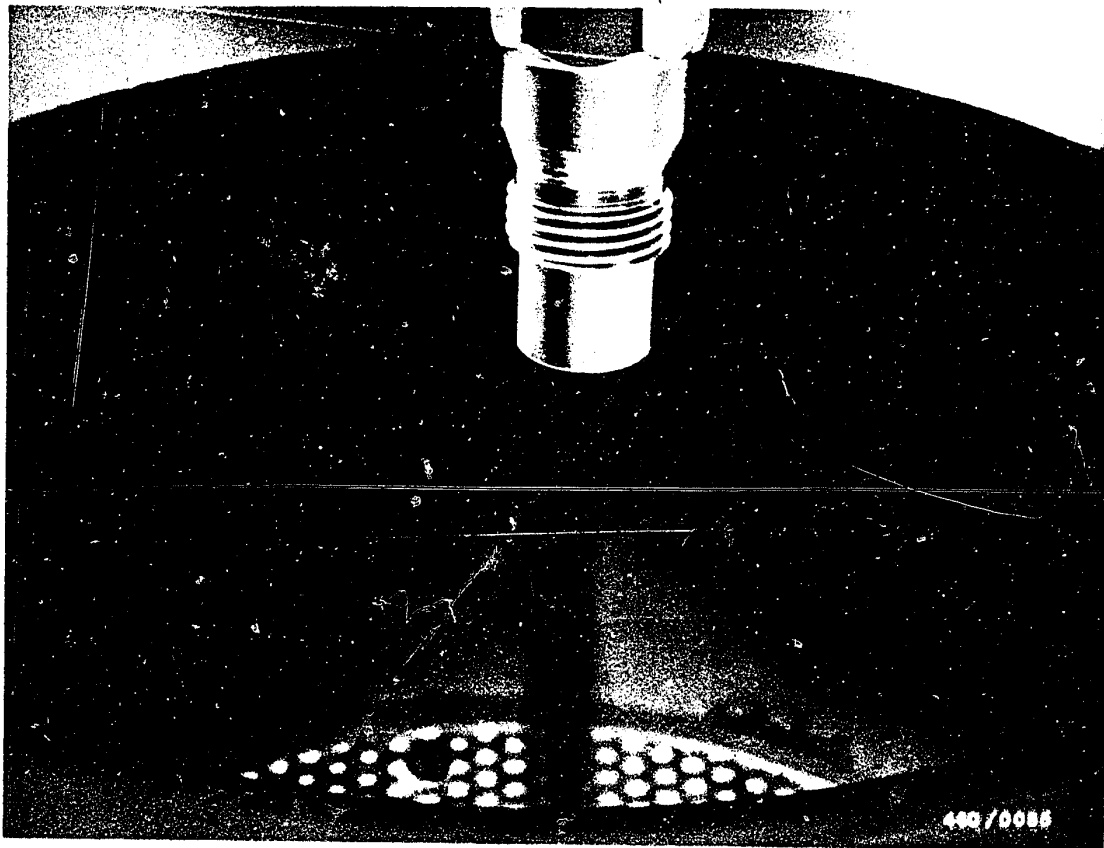
#### 19.4 Spray test

Switch off pressure gauge.

Until the high-pitched whistling tone is obtained, the spray may be in strands and unatomized. A divided spray and the formation of cords are not important in this range. Assessment of the shape of the spray is possible only when the lever is jerked quickly (4...6 downward movements/sec.).

The spray must then be well atomized. The cross-section of the spray has an oval shape and is larger than the spray of a throttling pintle nozzle without flat on the pintle.





## Testing of pintle nozzles

### 19.5 Spray test

Switch off pressure gauge.

Assessment of the spray pattern is possible only when the lever is moved quickly (approx. 4 - 6 strokes per second). The spray must be quite concentrated and break off cleanly.

### 19.6 Chatter test

The pressure gauge is switched off.

Fully depress the lever of the tester slowly (1 - 2 strokes per second).

Nozzles in good working order must chatter when fuel escapes.

### 19.7 Check injection pressure

Switch on pressure gauge.

Slowly force lever downwards. When nozzle begins to squirt, read off injection pressure.

In the case of deviations from the set value, the nozzle-opening pressure must be adjusted by shims behind the pressure spring in the nozzle-holder assembly.

Set value: 130 + 8 bar

thicker shims = higher nozzle-opening pressure

thinner shims = lower nozzle-opening pressure

Increasing the spring travel by 0.05 mm causes a 5.0 bar increase in the nozzle-opening pressure.

#### Note:

When assembling the injection nozzle, comply with the tightening torque of 70 - 90 Nm.

If the tightening torque is exceeded, the needle valve may stick.

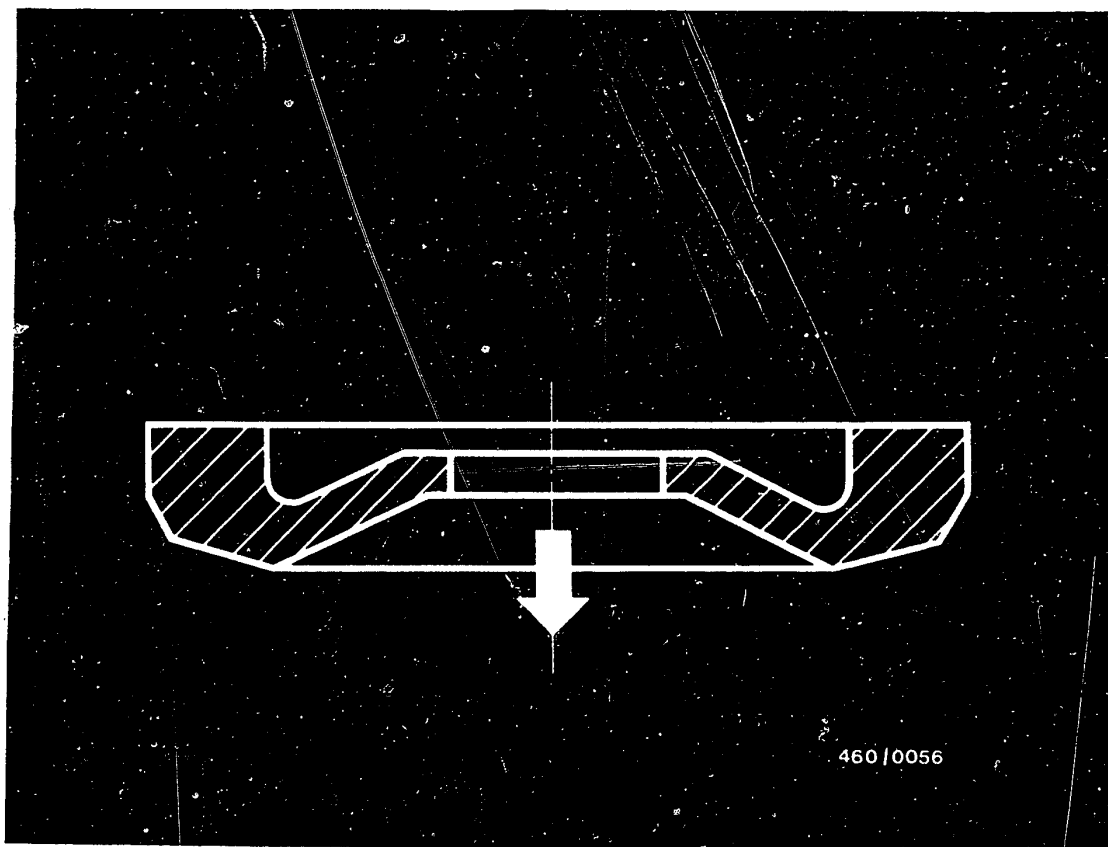
### 19.8 Leak test

Switch on pressure gauge.

Slowly force lever downwards and maintain pressure at approx. 20 bar below opening pressure for 10 seconds. The nozzle must not drip during this period.







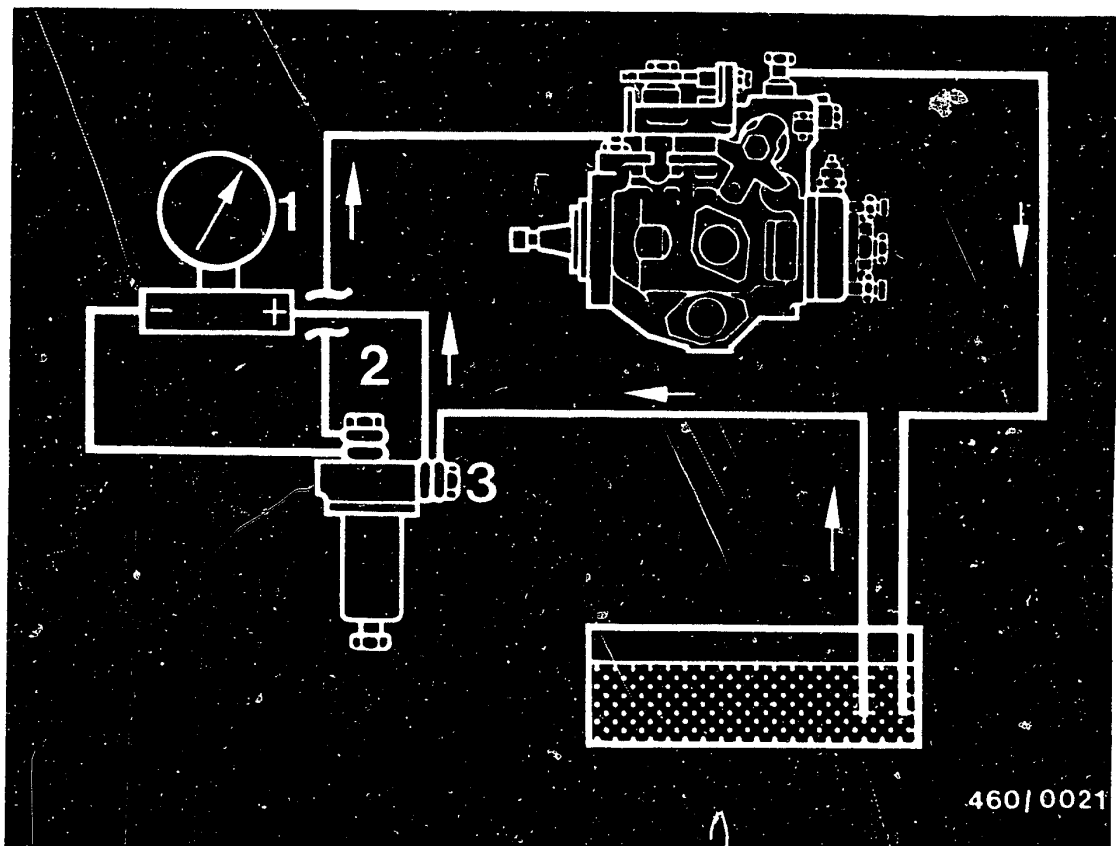
### 19.9 Fit injection nozzles

Before fitting the injection nozzles, fit a new heat seal in the direction of the arrow with respect to the cylinder head (diagram).

Tighten fastening screws of nozzle-holder assembly to 70 Nm (7.0 kgfm).

Tighten union nuts of fuel-injection tubing to 25 Nm (2.5 kgfm).





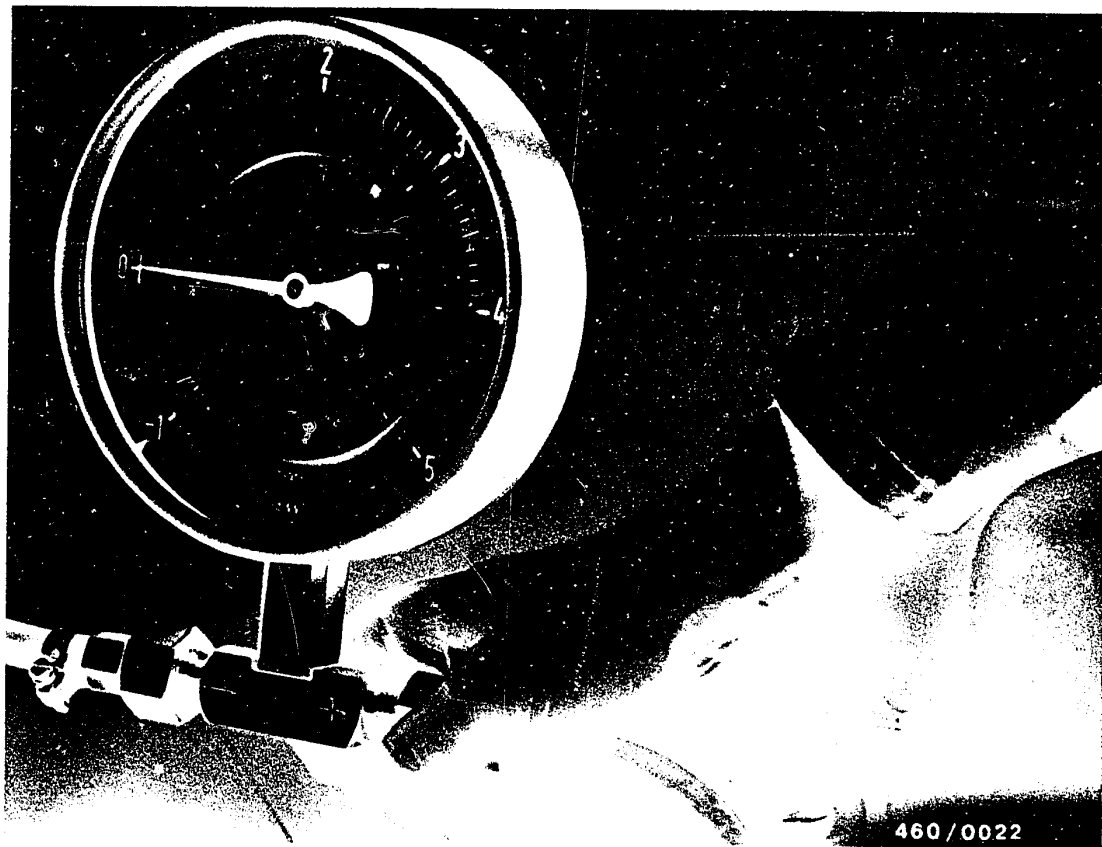
460/0021

- 1 = Differential-pressure gauge
- 2 = Filter outlet (use inlet union and extra-long inlet-union screw 2 443 456 020).
- 3 = Filter inlet (use inlet union and extra-long inlet-union screw 2 443 456 020).

## 20. Check fuel filter

Connect differential-pressure gauge to fuel filter using appropriate connecting pieces.

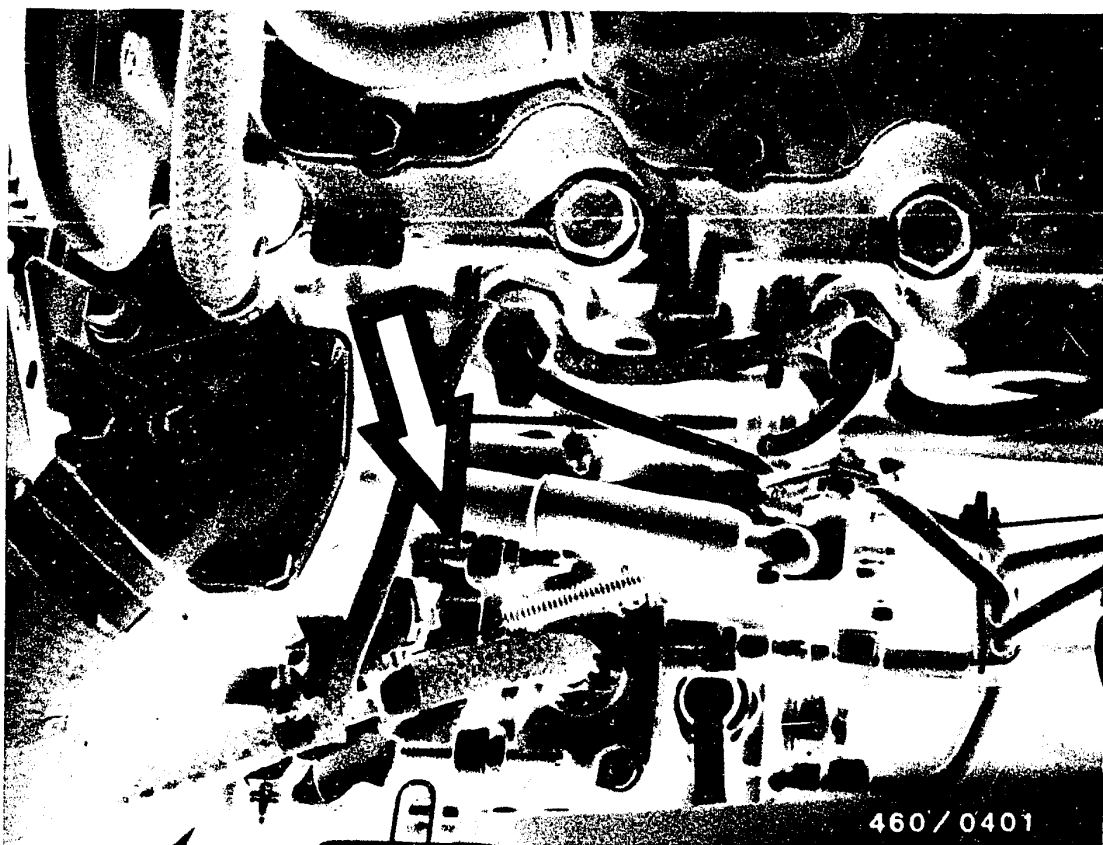




Connect the (+) side of the differential-pressure gauge to the fuel filter inlet. Fit the (-) connection of the pressure gauge to the filter outlet. See connection diagram.

Run engine until you are sure that there is no air in the fuel system.





Move control lever of fuel-injection pump briskly (approx. 1 second) from idle stop to maximum-speed stop.

Release control lever and read off differential-pressure on pressure gauge.

The maximum permissible differential pressure is 0.3 bar. If this value is exceeded, replace filter. Remove test connections.

If necessary, bleed fuel system.



## 21. Check pre-heating system

### 21.1 Necessary test equipment

Voltmeter/ammeter

e.g. ETT 011.00

0 684 101 100

### 21.2 Workshop information

We recommend that the sheathed-element glow plugs be replaced every 45,000 km.

For each repeat start the glow-plug and starter switch must first of all be set to position 1 and then to position 2 in order to obtain renewed pre-heating.

This makes it possible for the safety switch-off circuit installed in the glow-duration unit to be re-activated.



## Check pre-heating system

Before testing make sure of the following:

- Battery O.K.
- Compression O.K; if necessary, test compression loss
- Fuel supply/injection system O.K.

Starting motor operates, engine fails to start or starts only with great difficulty

yes

Test power supply to sheathed-element glow plugs.  
Connect voltmeter to sheathed-element glow plugs one after the other and to ground. Set glow-plug and starter switch to position 2.  
Voltmeter must indicate min. 10 V.  
Caution: After at least 26 seconds the system switches off automatically. If the measurement has to be repeated, the glow-plug and starter switch must first of all be returned to position 1 and then position 2. Minimum voltage present?

no

Minimum voltage not present at all sheathed-element glow-plugs.  
1. Test for open circuit in lead from sheathed-element glow plugs to glow-duration unit term. 87. If necessary eliminate open circuit.  
2. Test for open circuit in ground lead term. 85 from glow-duration unit. If necessary, eliminate open circuit.  
3. Test for open circuit in lead from positive battery terminal to glow-duration unit term. 30. If necessary, eliminate open circuit.  
4. Test for open circuit in lead from positive battery terminal via glow-plug and starter switch term. 15 to glow-duration unit term. 86. If necessary, eliminate open circuit.  
If points 1...4 O.K., replace glow-duration unit.

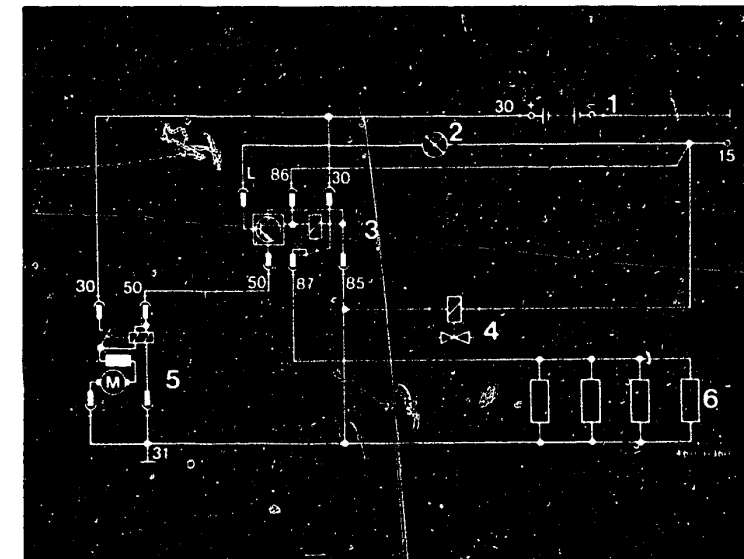
yes

Test start repeater lamp.  
Set glow-plug and starter switch to position 2. Start repeater lamp must light up.  
Does start repeater lamp light up?

no

Test for open circuit in lead from glow-plug and starter switch term. 15 to glow-duration unit term. L including start repeater lamp as well as its ground connection.  
If necessary, eliminate open circuit.

Continued on C23/C24



21.3 Terminal diagram for pre-heating system

- 1 = Battery
- 2 = Visual indication
- 3 = Glow-duration relay
- 4 = Solenoid-operated valve
- 5 = Plug
- 6 = Sheathed-element glow plugs



Starting motor operates, engine fails to start or starts only with great difficulty

yes

Test safety switch-off circuit. Connect voltmeter to a sheathed-element glow plug and to ground. Set glow-plug and starter switch to position 2. Voltmeter must indicate voltage for at least 26 seconds. At the end of the specified period the voltmeter must indicate 0 V. Voltmeter at 0 V after the specified period?

no

Replace glow-duration unit.

yes

Test pre-heating while starting motor is being operated. Connect voltmeter to sheathed-element glow-plug and to ground. Set glow-plug and starter switch to position 3 (operate starting motor). Voltmeter must indicate a voltage of approx. 10 V. Voltage present?

no

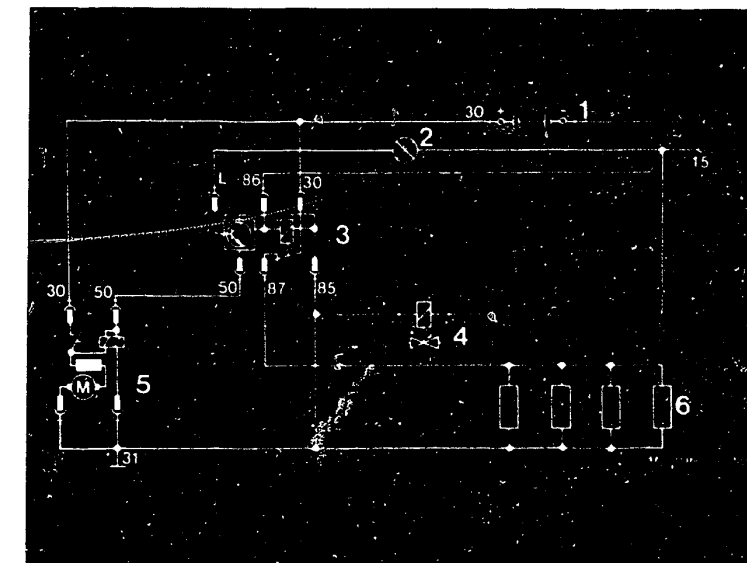
- 1) Test for open circuit in lead from glow-plug and starter switch term. 50 to glow-duration unit term. 50. If necessary, eliminate open circuit.
- 2) If Point 1 O.K., replace glow-duration unit.

yes

Test sheathed-element glow plugs. Using ohmmeter, test sheathed-element glow plugs individually for continuity. O.K.?

no

Replace sheathed-element glow plug.



21.3 Terminal diagram for pre-heating system

- 1 = Battery
- 2 = Visual indication
- 3 = Glow-duration relay
- 4 = Solenoid-operated valve
- 5 = Plug
- 6 = Sheathed-element glow plugs

**C23**

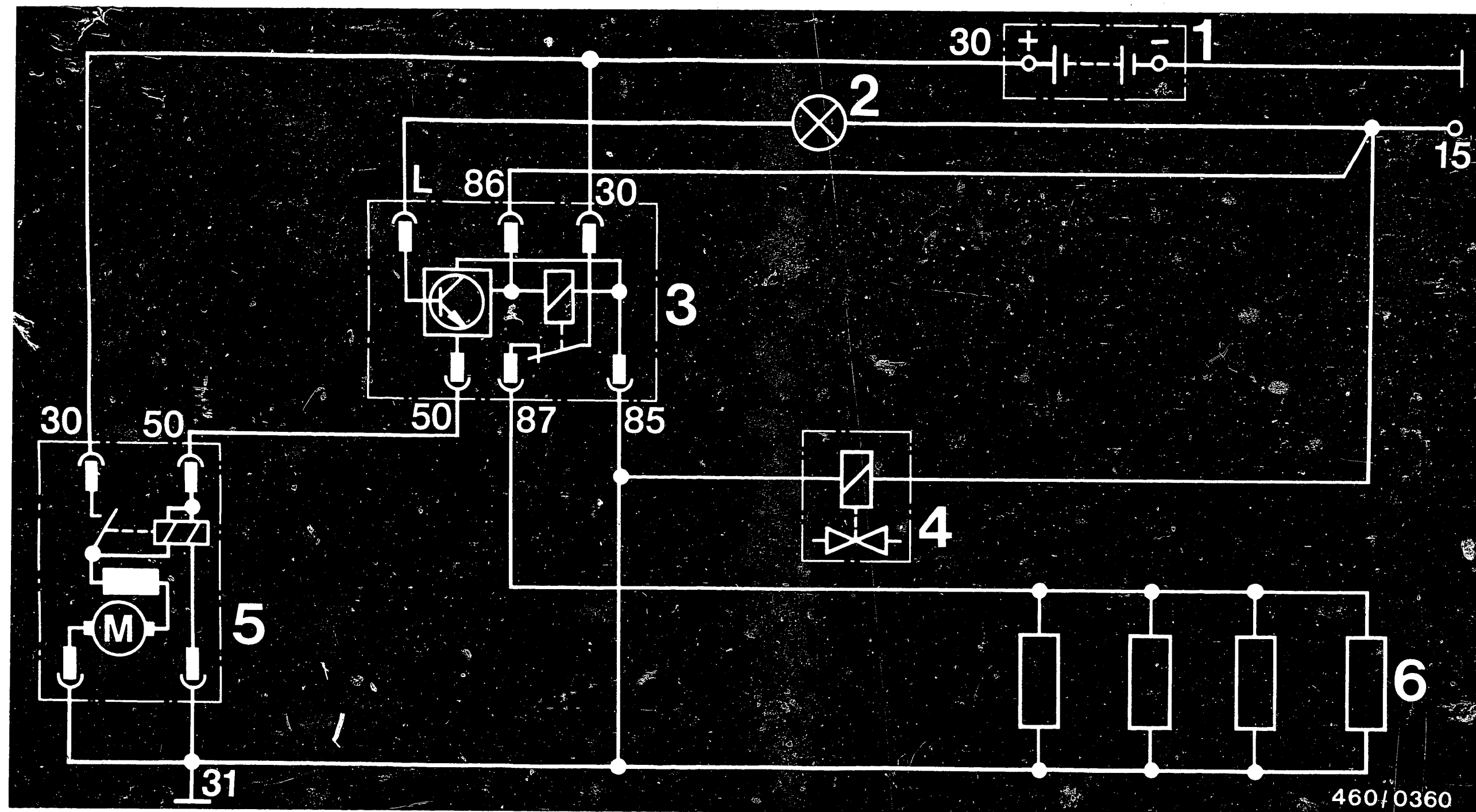
Check pre-heating system  
Opel Ascona/Kadett-Diesel



**C24**

Check pre-heating system  
Opel Ascona/Kadett-Diesel





460/0360

### 21.3 Terminal diagram for pre-heating system

1 = Battery  
2 = Visual indication

3 = Glow duration control unit  
4 = Solenoid-operated valve

5 = Starting motor  
6 = Sheathed-element glow plug

**D1**

Check pre-heating system  
Opel Ascona/Kadett-Diesel



**D2**

Check pre-heating system  
Opel Ascona/Kadett-Diesel





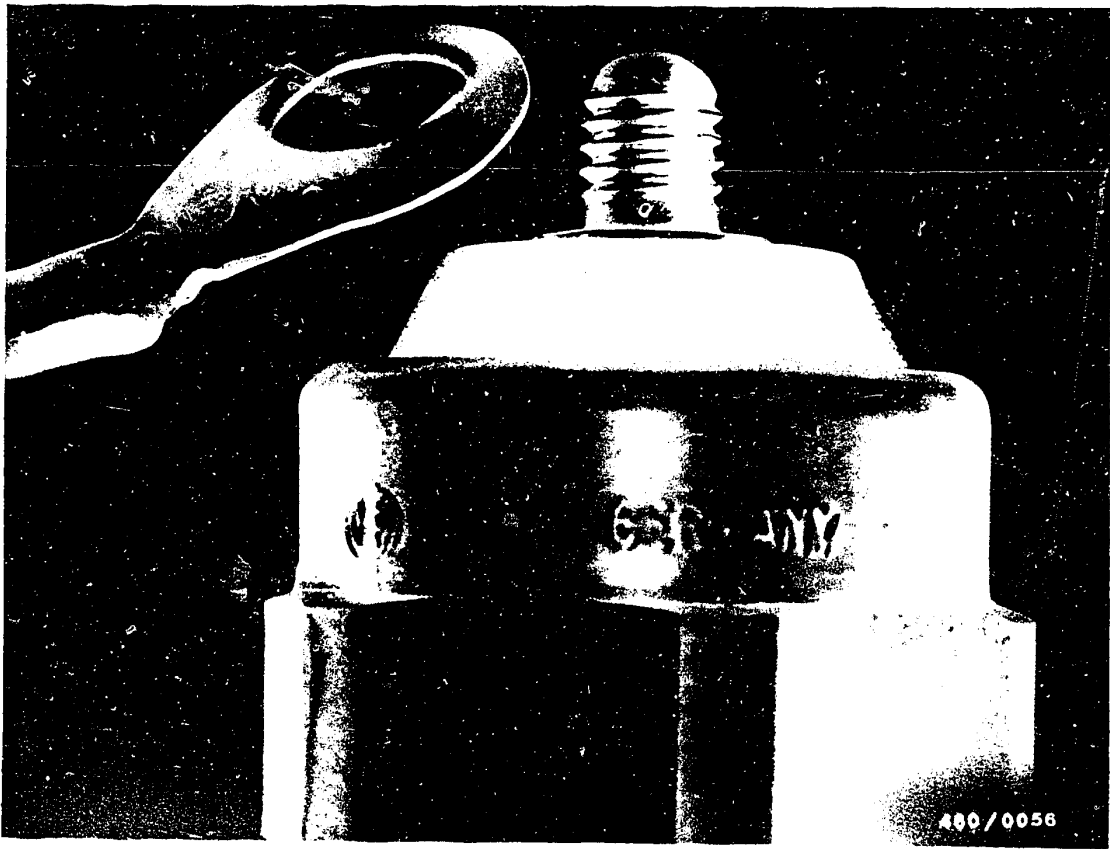
## 22. Check timing device

In distributor-type fuel-injection pumps VE..F.. the timing device is integral with the fuel-injection pump.

In order to test the timing device, it is necessary to remove the fuel-injection pump.

Perform the test on the injection-pump test bench.





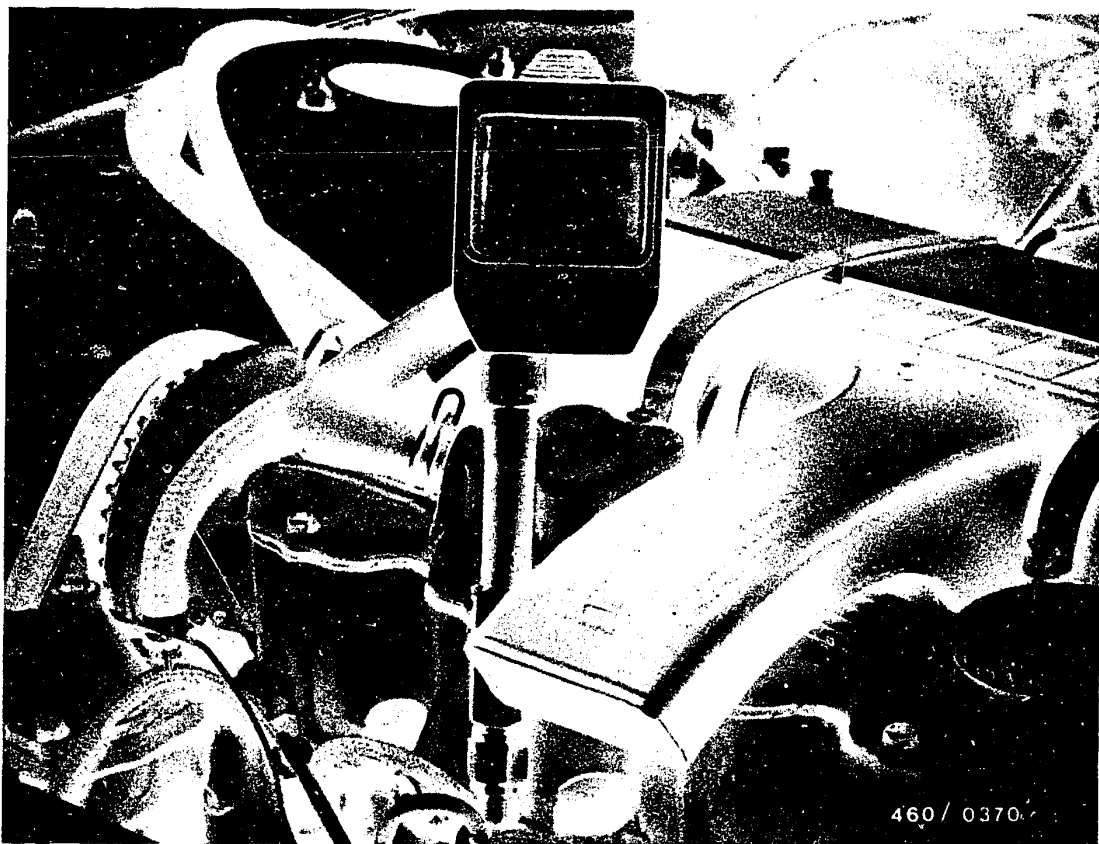
## 23. Measure engine compression and compression loss

### 23.1 Measure engine compression

Fit new chart in compression tracer. Mount high-pressure hose on tracer. Switch off engine.

In order to prevent fuel from being injected, remove connecting cable from shutoff magnet on distributor-type fuel-injection pump (picture).





Remove all sheathed-element glow plugs.  
Using the starting motor, turn over the engine several times so that loose deposits are removed from the compression space.

Screw connecting nipple into the respective thread.

Fit high-pressure hose of compression tester on to connecting nipple.

Note:

Checking the compression takes place at operating temperature (approx. 80°C coolant temperature).



During the following operation, note first compression stroke.

Operate starting motor until there is no longer any detectable rise in pressure on the compression tracer.

Bleed compression tracer by pressing on bleeder valve.

The pointer returns to the starting position.

Move chart onto next position.

Fit connecting nipple to the other cylinders and repeat measurement.

Set value: 20 ... 30 bar  
min. 17 bar

**D6**

Measure engine comp. and comp. loss

Opel Ascona/Kadett-Diesel



### 23.1.1 Evaluation of chart

#### 1. Normal pressure rise

If piston rings and valves are in good condition, the first compression stroke shows the highest pressure increase.

During the following compression strokes the compression builds up to the maximum pressure.

#### 2. Gradual pressure rise

If, from the start, the compression increases only gradually on each piston stroke, this points to burnt valve seats or defective valve guides.

#### 3. Low maximum pressure

If the maximum pressure obtained is too low on all cylinders, this points to defective pistons, piston rings or valves.

If the compression is too low on two neighbouring cylinders, this points to a leaky cylinder head gasket.



#### 4. Varying compression

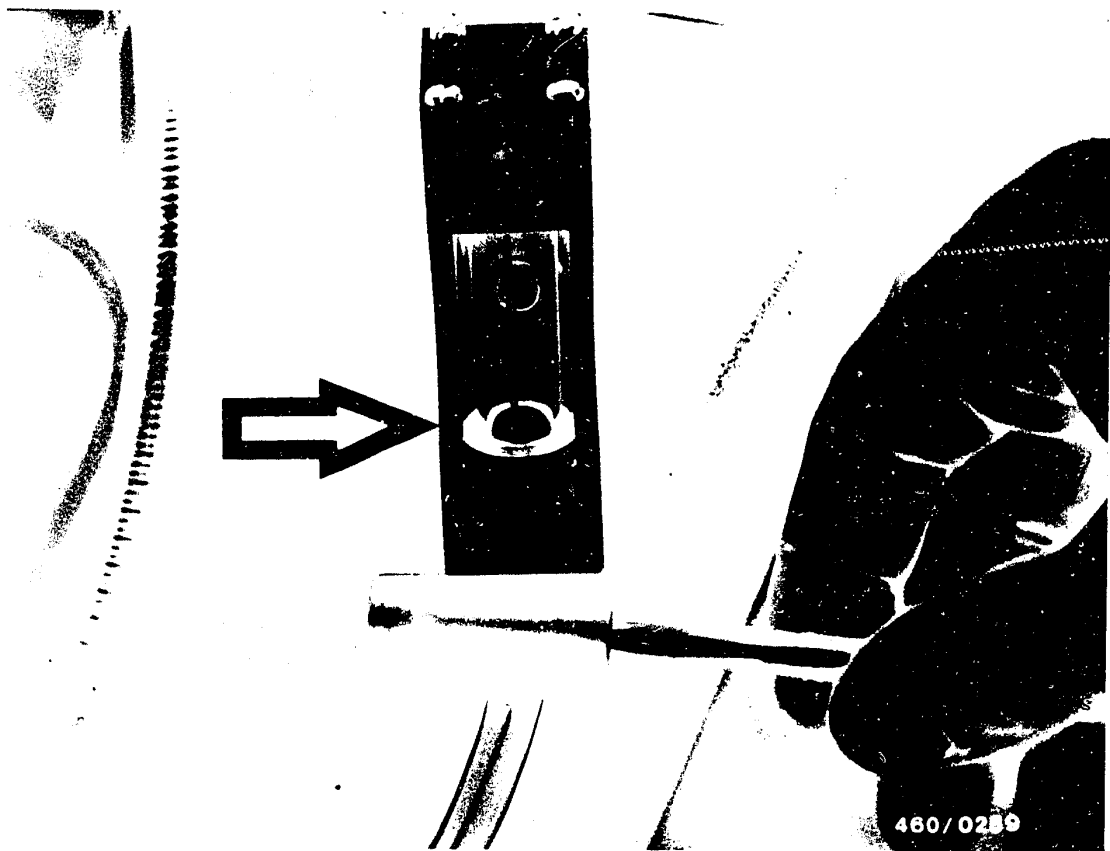
If one cylinder shows a clearly lower compression, proceed as follows: fill in 2-3 cm<sup>3</sup> of engine oil through the opening of the sheathed-element glow plug or nozzle-holder assembly and operate starting motor briefly.

Repeat measurements and compare charts. - If there is a clear increase in compression during the second test, then the piston rings or cylinders are worn. If there is no change in the result, then defective valves are the cause.

#### 5. Uniform compression

Uniform compression is extremely important with regard to the smooth running of the engine. Maximum compression is, therefore, not the only objective.





### 23.2 Measure compression loss of engine

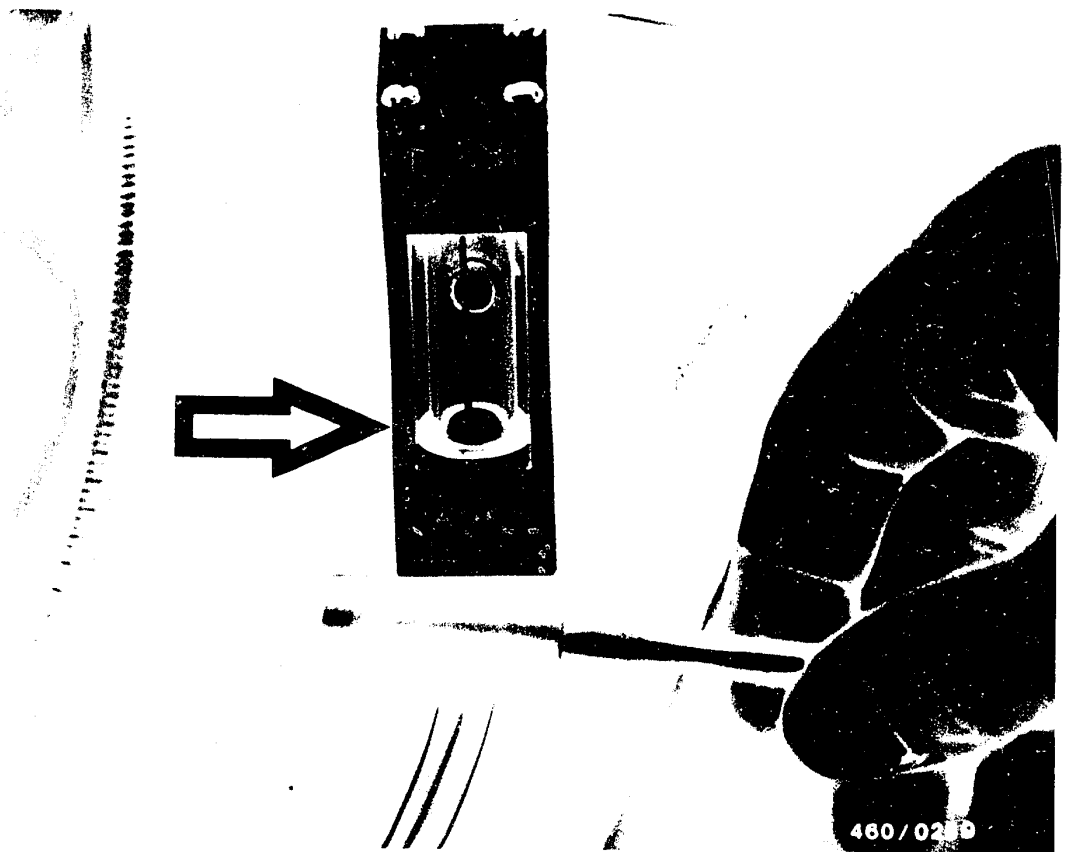
The test is performed using the Bosch compression-loss tester 0 681 001 901 (EFAW 210 A).

For testing, the respective piston must be at TDC (TDC = top dead centre) on the compression stroke.

For setting this position, use DC detector 1 688 132 025 (included in accessories with compression-loss tester).

Perform test with engine at normal operating temperature (temperature of water approx. 80 °C).





### 23.2.1 Set top dead centre

Remove sheathed-element glow plug from cylinder 1.

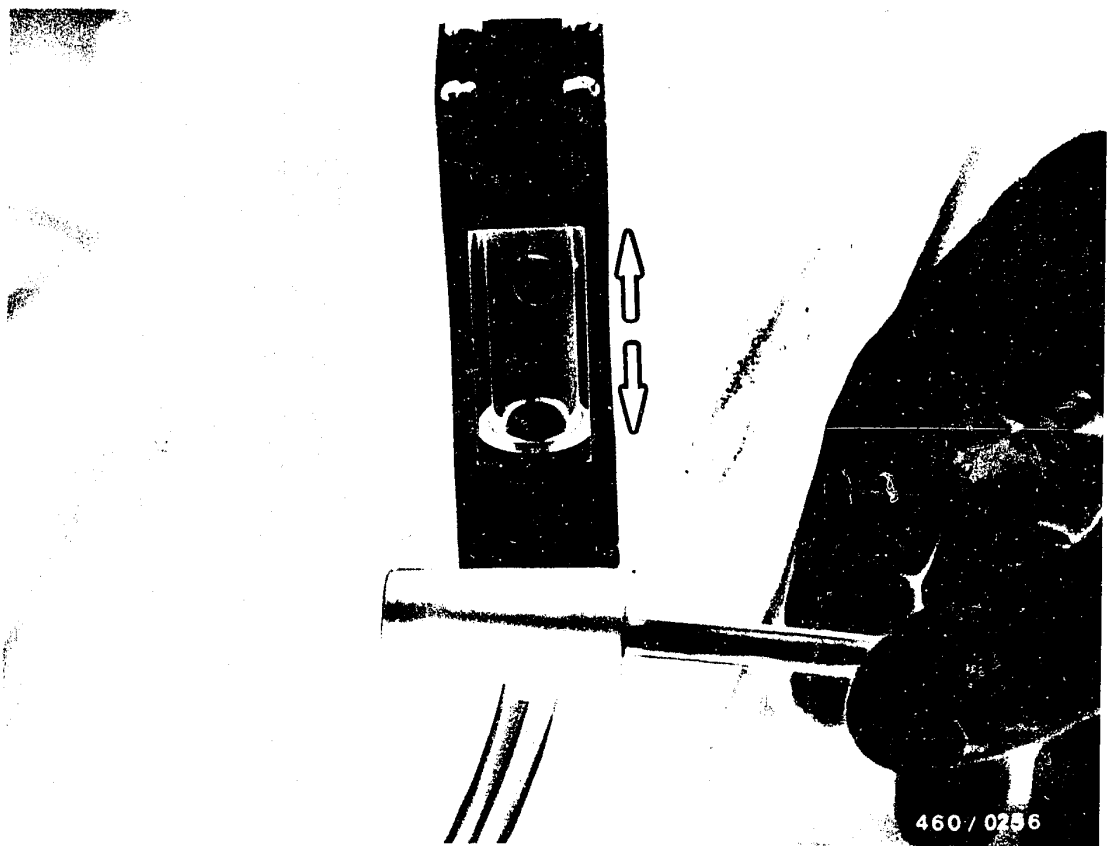
Insert rubber plug of DC detector into bore for sheathed-element glow plug.

Using magnetic clamp, mount glass cylinder in as vertical a position as possible in the engine compartment. The piston of the unit must be easily visible.

Slowly turn the engine over by hand in its direction of rotation. (If necessary, select gear and push vehicle).



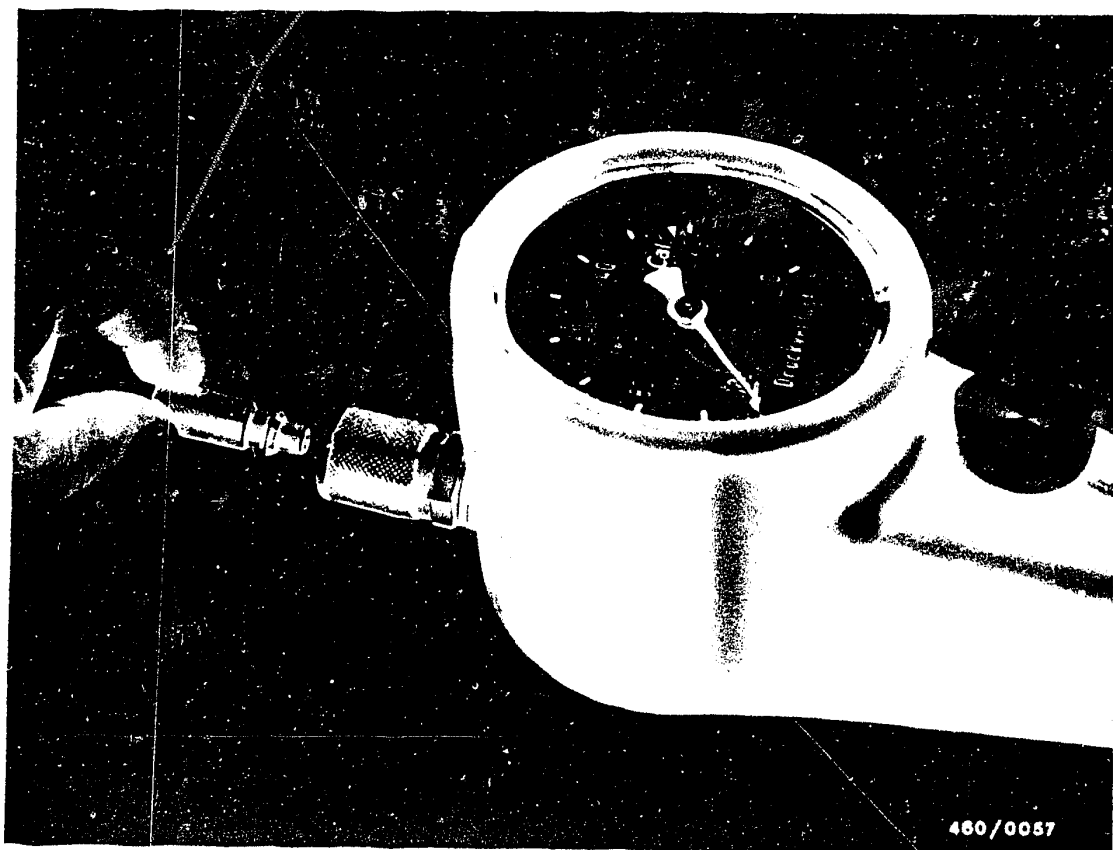




On the compression stroke, the piston of the DC detector is forced upwards.

As top dead centre is passed over, the piston slides down again immediately.

Locate top dead centre by carefully turning the engine backwards and forwards.



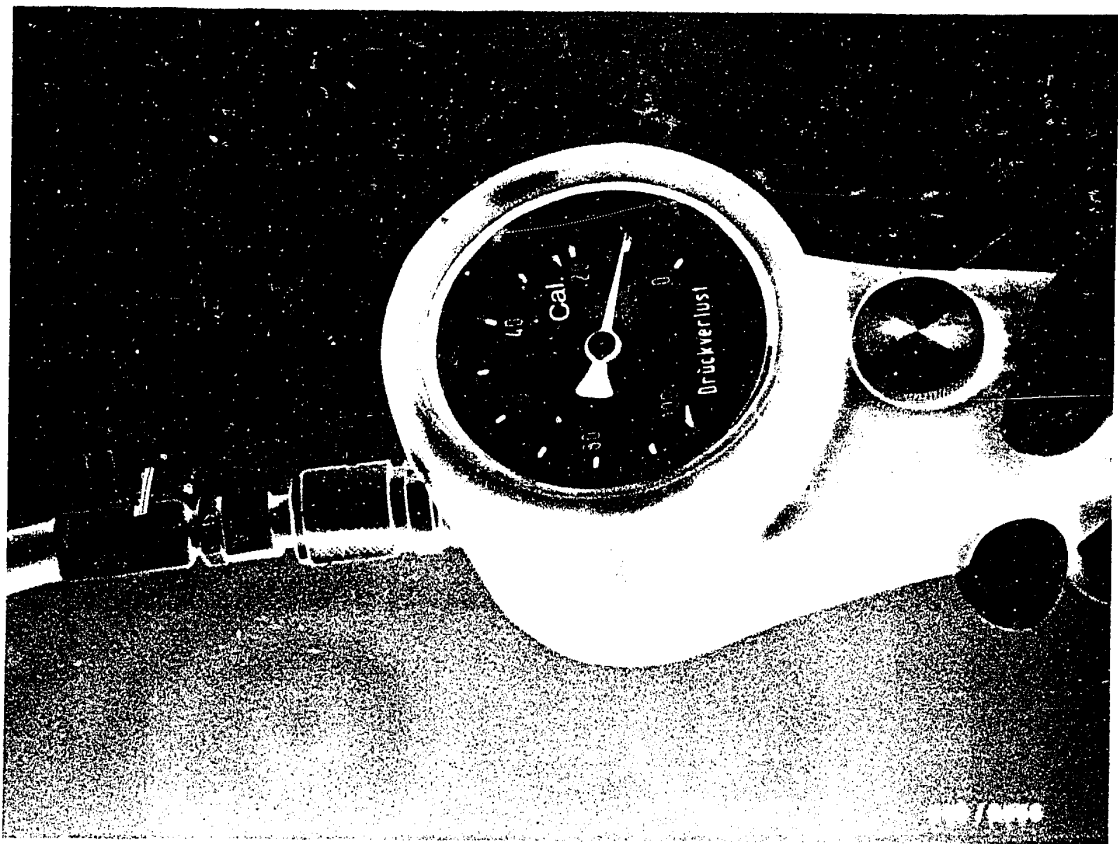
### 23.2.2 Measure compression loss

Connect tester to compressed-air mains.

Connect calibrating nozzle 1 680 363 036. Set a compression loss of  $23 \pm 1\%$  (marking "Cal".) at the knurled thumbscrew on the pressure-regulating valve. Disconnect calibrating nozzle.

(Instrument indicator must show approximately 0% compression loss - equipment check.)





Screw in fitting and mount test hose.  
Select gear and pull on handbrake.  
Connect test hose to tester.  
Read off compression loss in % on instrument.

Note:

Before testing the next cylinder, turn the engine over briefly without pre-heating using the starting motor so that the oil film re-forms.

Firing sequence 1 - 3 - 4 - 2

### 23.2.3 Evaluation of test

The compression loss indicated should not exceed 25%.

Differences of 10% between the individual cylinders can be ignored.

The causes of greater losses can be located because the air makes a noise as it escapes.

Listen at the following points:

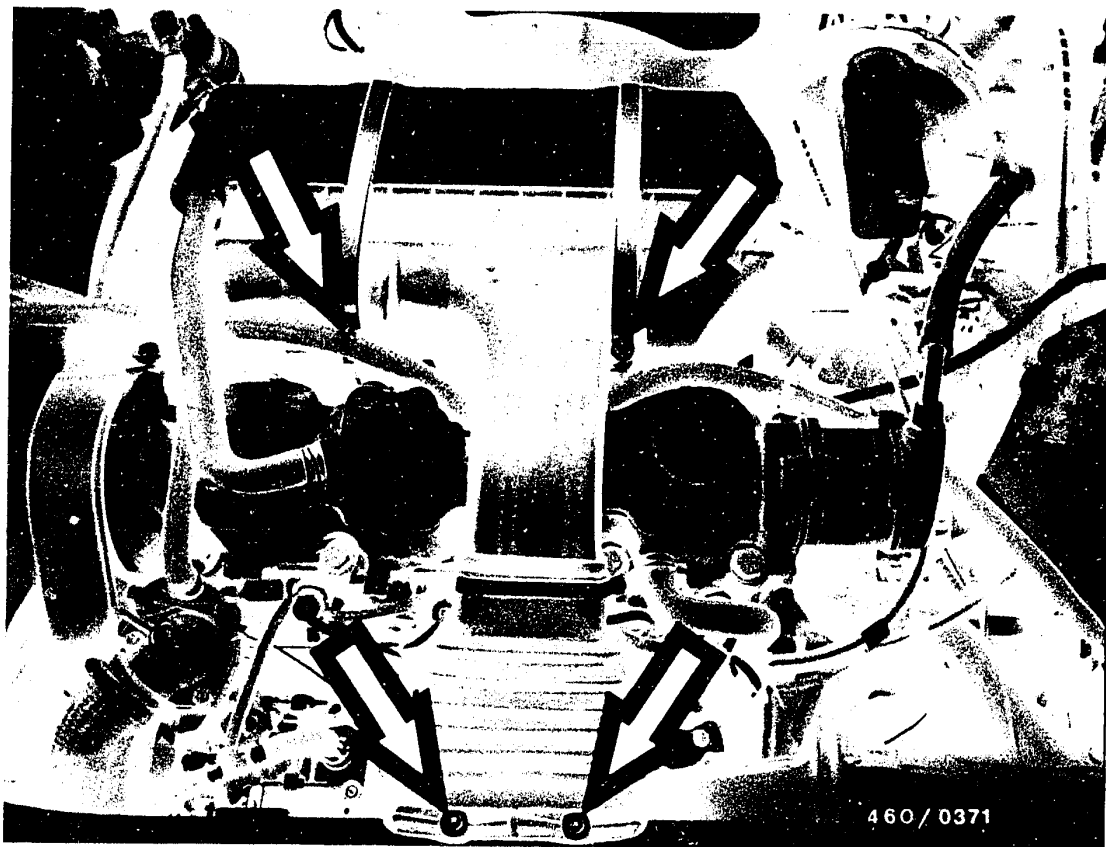
<u>Location of noise</u>	<u>Possible trouble</u>
Intake manifold (remove air filter)	Intake valve
Exhaust manifold	Exhaust valve
Oil filler neck on engine	Pistons, piston rings
Cooling water filler neck (air bubbles)	Cylinder head gasket

In order to trace the trouble even more accurately, fill approximately 2-3 cm<sup>3</sup> of engine oil into the cylinder. Repeat test.

If there is a clear decrease in compression loss during this test, then the fault lies with the piston or with the piston rings.

New engines which have not yet been run in (less than 5,000 km) may show higher compression losses than after the running-in period.

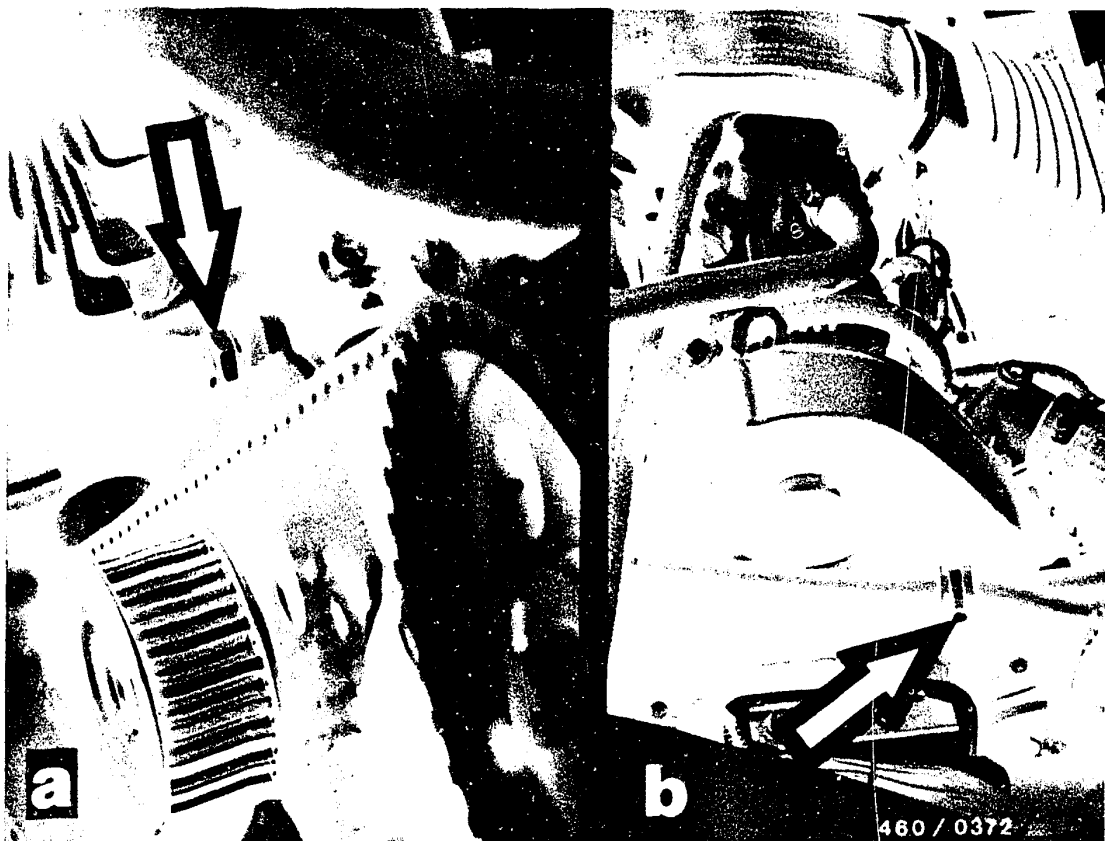




#### 24. Remove fuel-injection pump

Disconnect negative cable from battery.  
Remove pipe between air-intake dome and intake manifold.  
Loosen retaining bands on air-filter housing and remove  
air-filter housing.





Loosen alternator belt-adjustment link and take off V-belt (picture a, arrow).

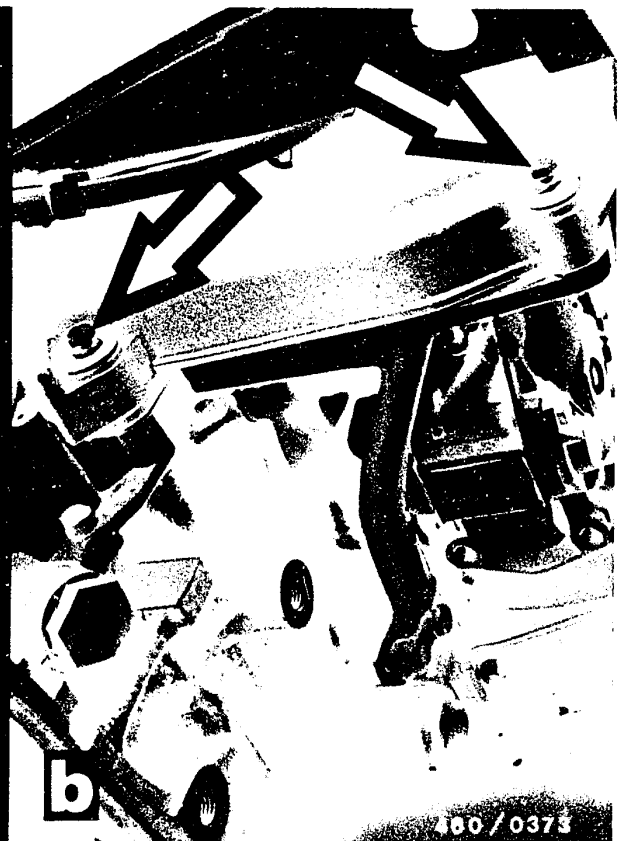
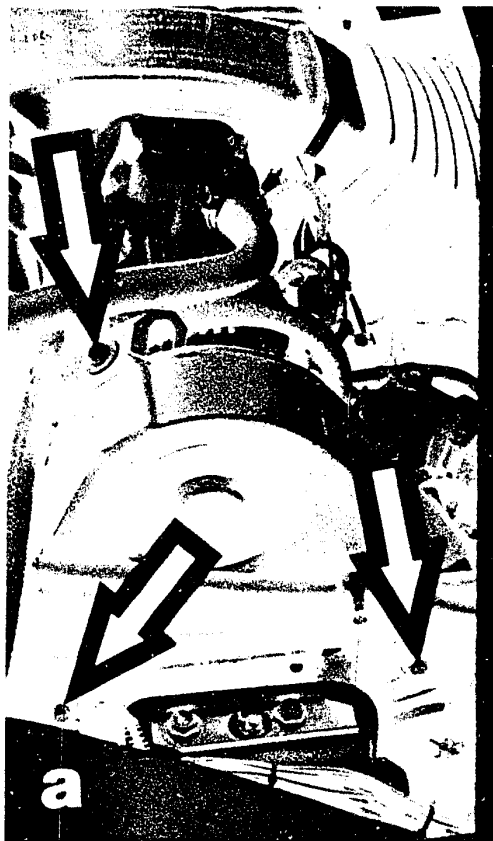
Undo hose connector (picture b, arrow) and unscrew clamp on upper toothed-belt cover.

**D16**

Remove fuel-injection pump

Opel Ascona/Kadett-Diesel



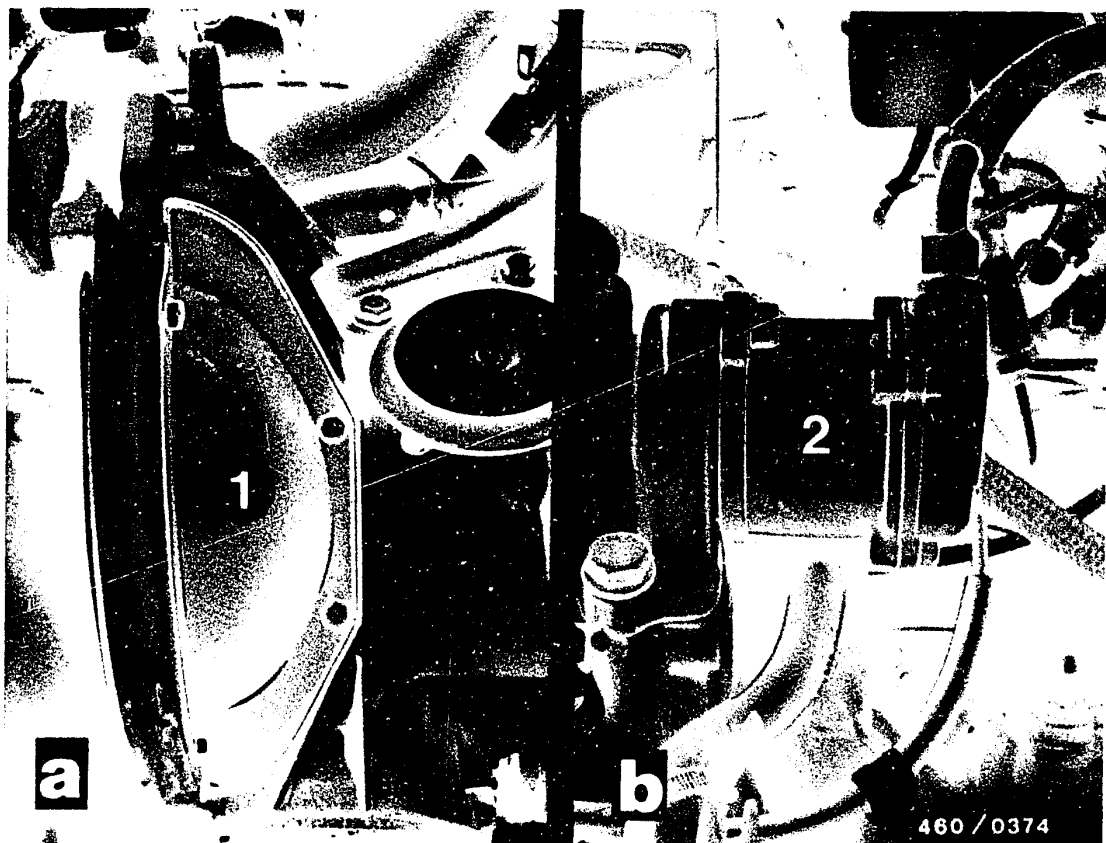


Remove upper and lower toothed-belt covers (Figs. a and b, arrows).

**D17**

Remove fuel-injection pump  
Opel Ascona/Kadett-Diesel

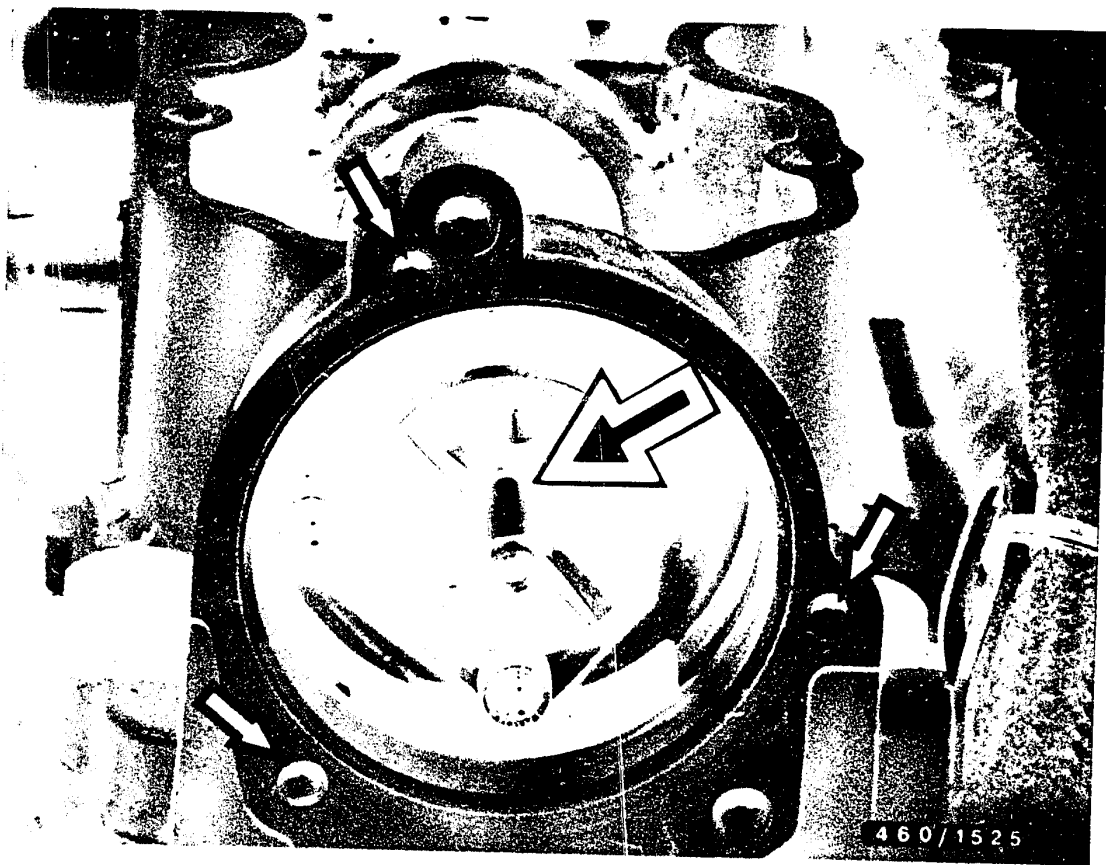




Remove cover (1) on clutch housing (picture a).

Remove vacuum pump (2) from camshaft housing (picture b).





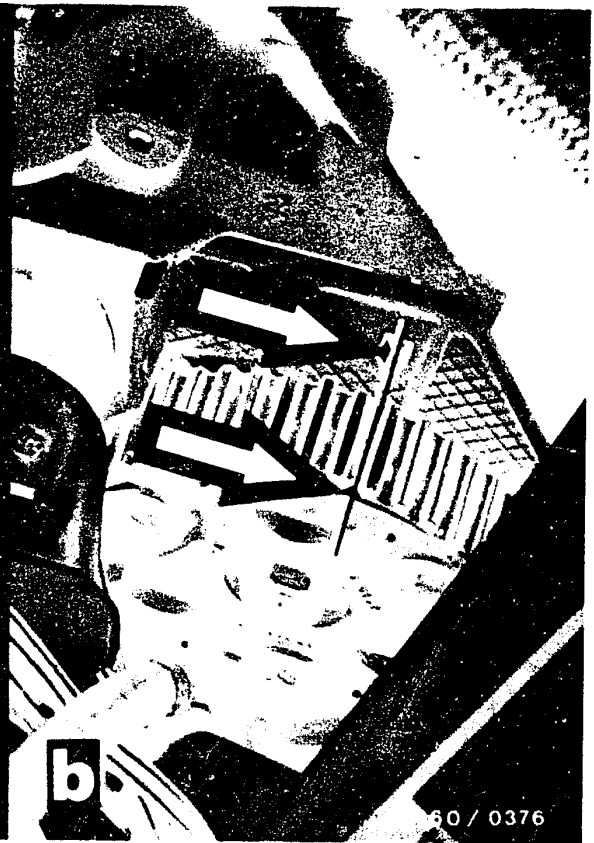
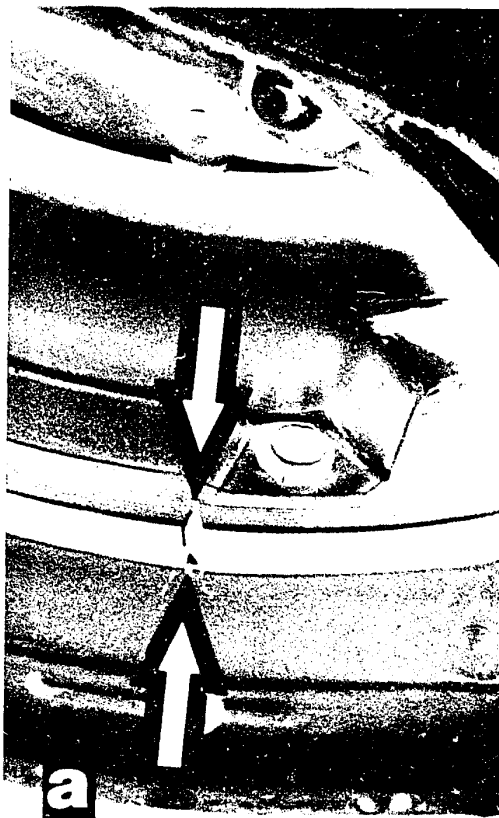
Remove driver and oil-supply line (arrow).

Remove cylinder head cover.

**Note:**

If there are no bores (outer arrows) in the camshaft housing for locating the holding device KDEP 1134, the procedure for locking the camshaft does not apply. Remove vacuum pump to see if bores are present.

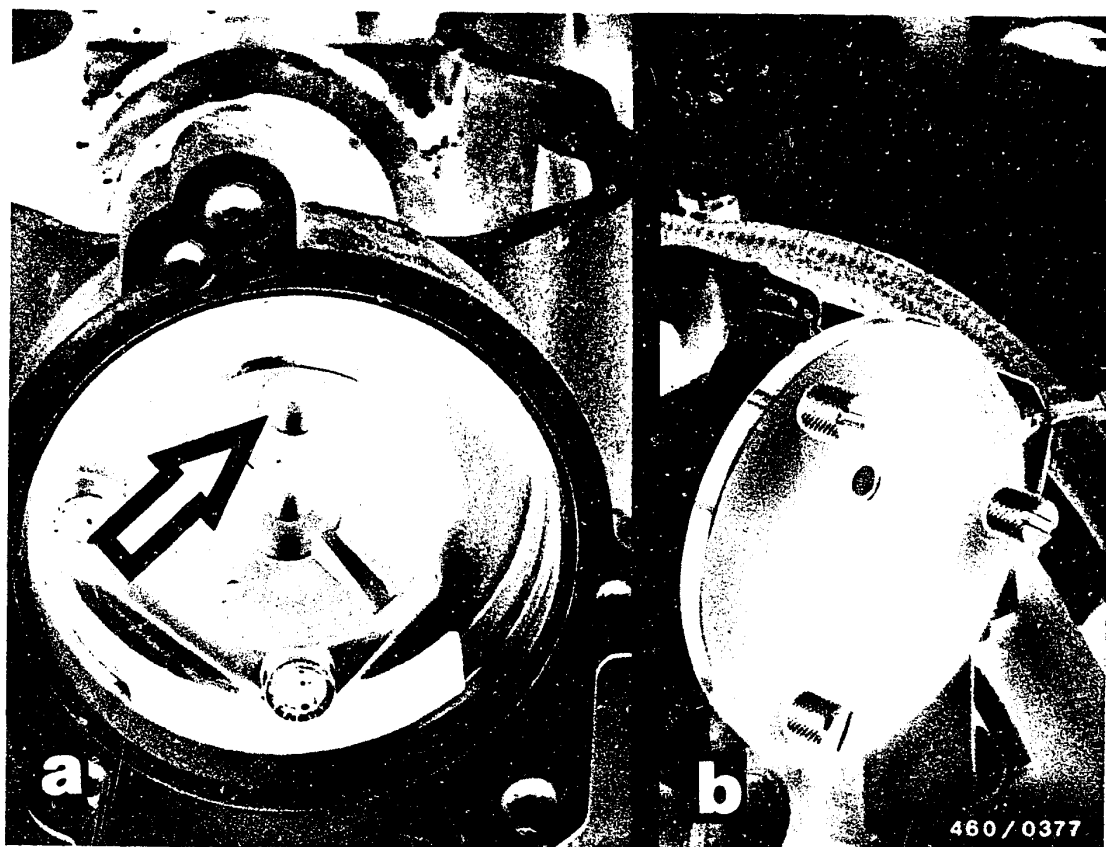




Turn crankshaft in direction of rotation of engine until mark on flywheel is opposite pointer on clutch housing (picture a).

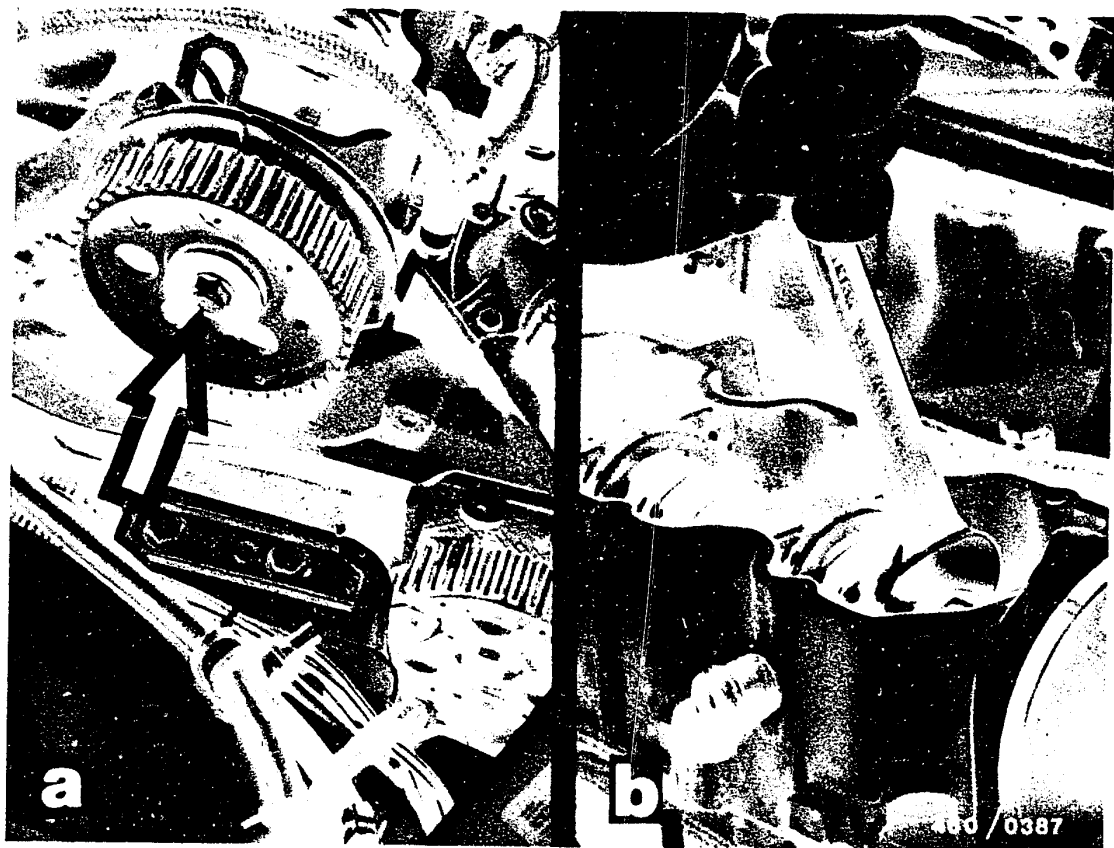
Piston of cylinder 1 is at TDC; valves of cylinder 4 are on overlap.

Mark on pump drive gear points to fixed mark on pump bracket (picture b).



Slide locating pin of holding device KDEP 1134 free of tension into bore (arrow) of camshaft and mount holding device.



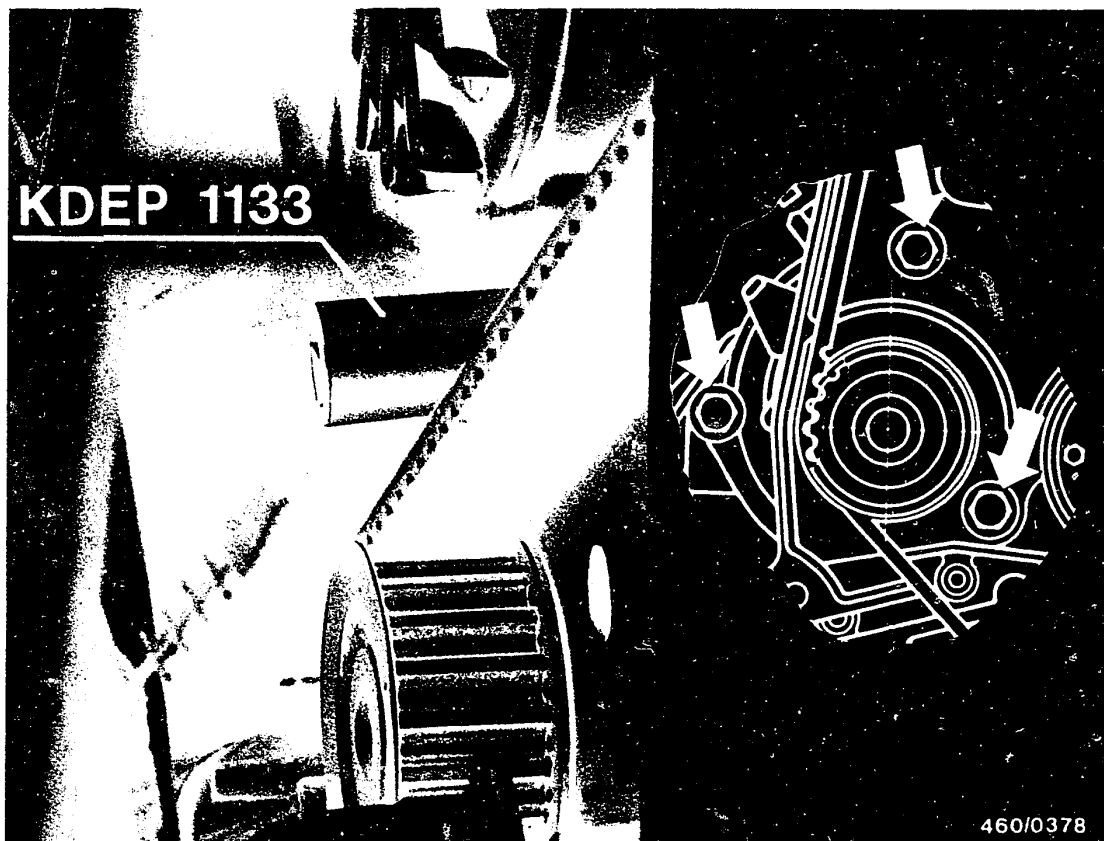


Loosen fastening screw (Fig. a, arrow) of camshaft gear.

To do this, counterhold with a single-head engineers wrench at the hexagon of the camshaft (Fig. b).



**KDEP 1133**



460/0378

Loosen water pump at fastening screws (arrows) and swivel using open-end wrench KDEP 1133.

Swivelling in clockwise direction:

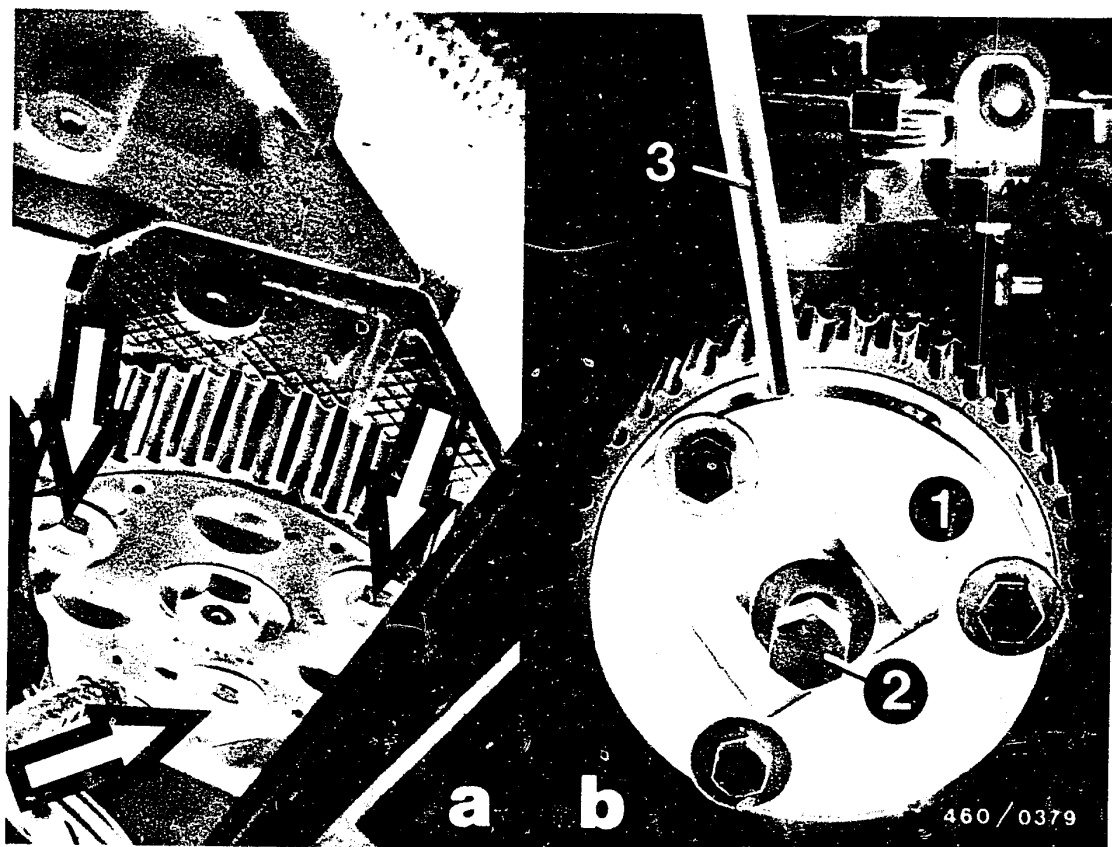
increases toothed-belt tension.

Swivelling in counterclockwise direction:

reduces toothed-belt tension.

Relax toothed belt and remove.





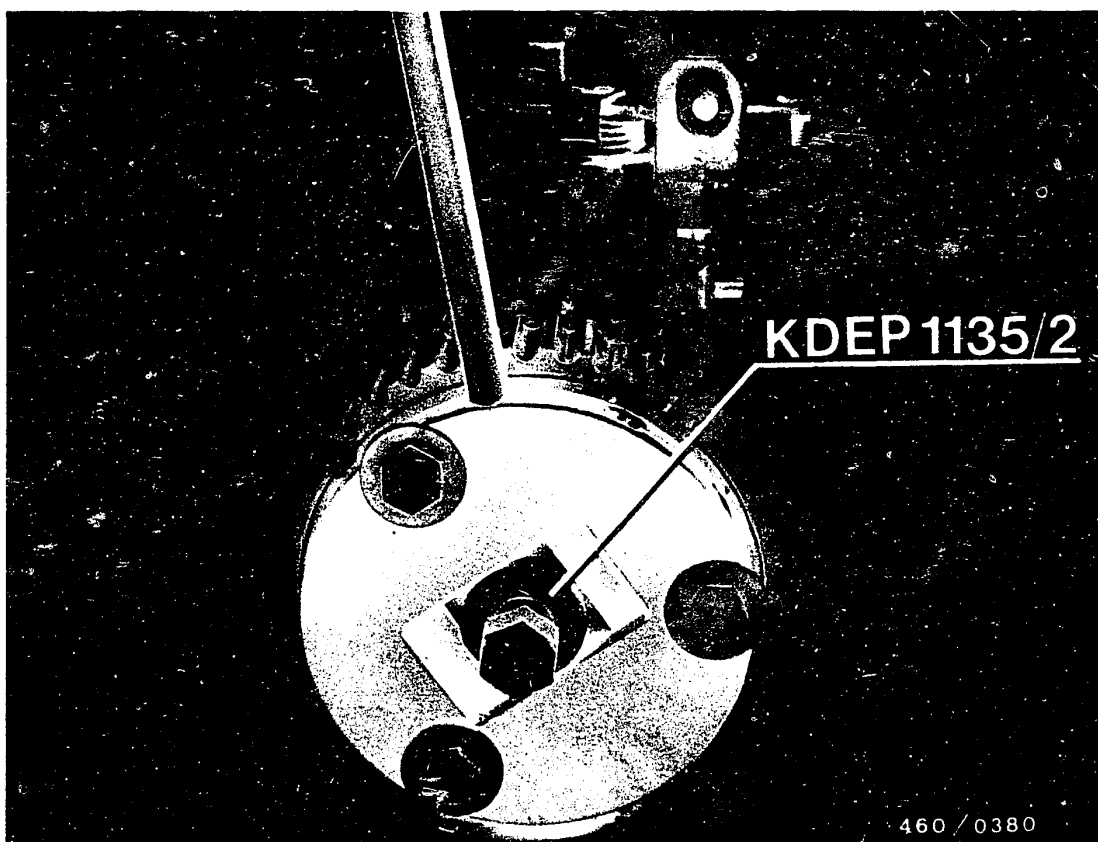
- 1 = Puller flange KDEP 1135/1
- 2 = Puller KDEP 1135/2
- 3 = Holding mandrel

Remove radiator grille.

Remove fastening screws (picture a, arrows) on injection pump gear.

Mount puller flange KDEP 1135/1 without puller KDEP 1135/2 and loosen fastening nut of drive shaft and remove. Hold pulling device with holding mandrel (3).





Insert puller KDEP 1135/2 in puller flange KDEP 1135 and turn through 90° to the stop.

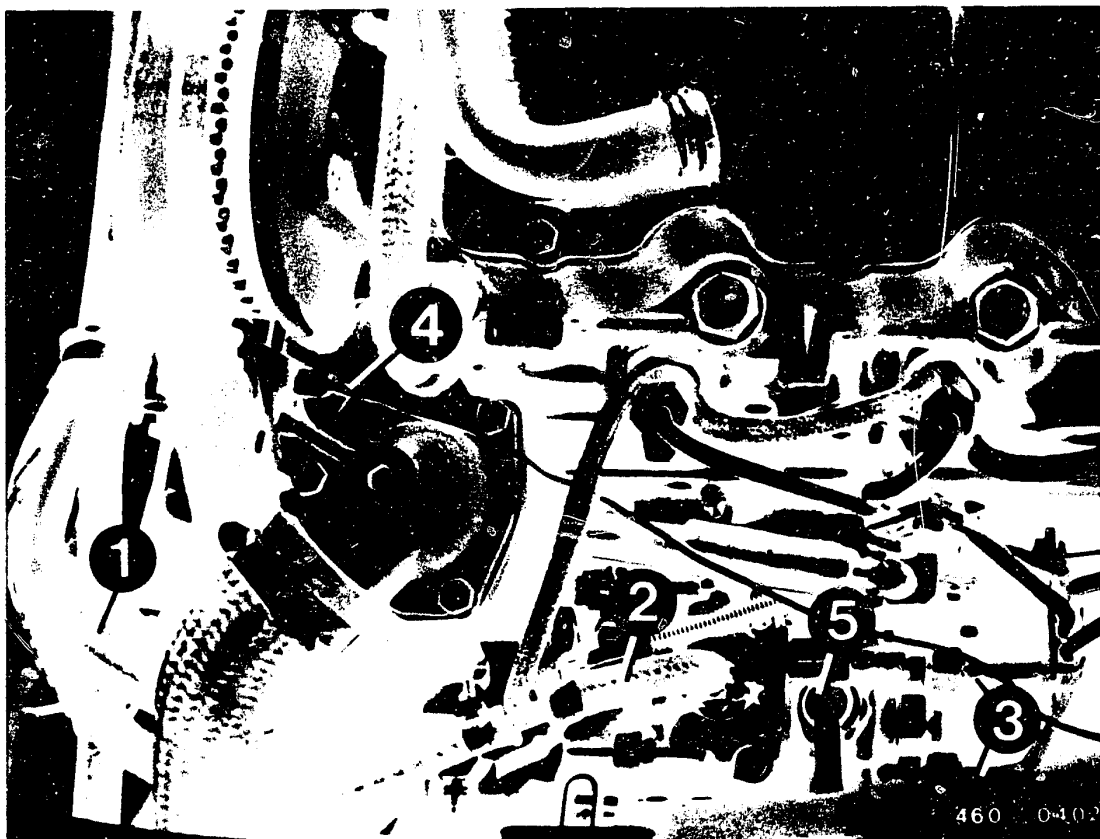
Hold pulling device with holding mandrel and remove injection pump gear from drive shaft.

Remove pulling device from injection pump gear.

**E1**

Remove fuel-injection pump  
Opel Ascona/Kadett-Diesel



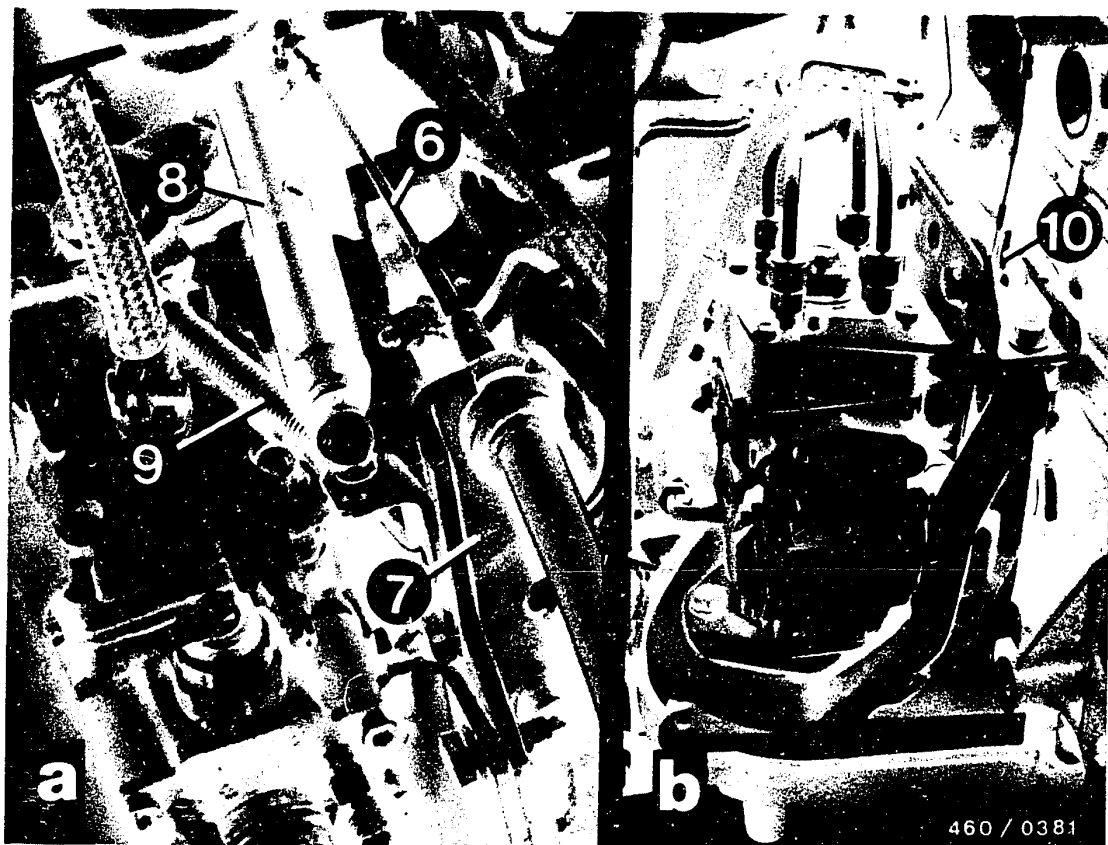


Remove fuel inlet line (1) from injection pump using Hazet wrench 2745, and remove fuel return line (2) from injection pump.

Loosen fuel-injection tubing (3) using open box wrench KDEP 1115.

Remove electric lead (4) from thermo-switch and shutoff solenoid (5).

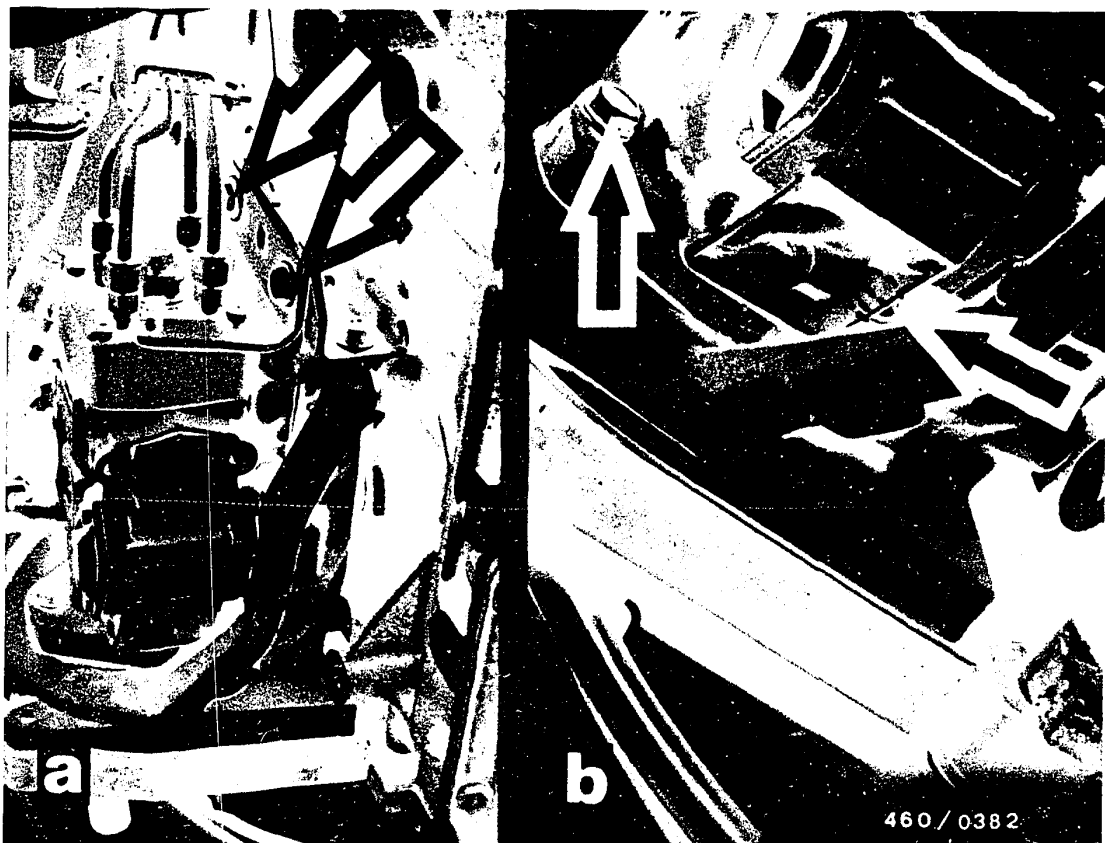




Unhook accelerator cable (6) from injection pump control lever and remove from holding bracket (7).

Unhook damper (8) and spring (9) from control lever.  
Remove securing clamp (10) from cable for cold-starting aid and uncouple actuating cable.

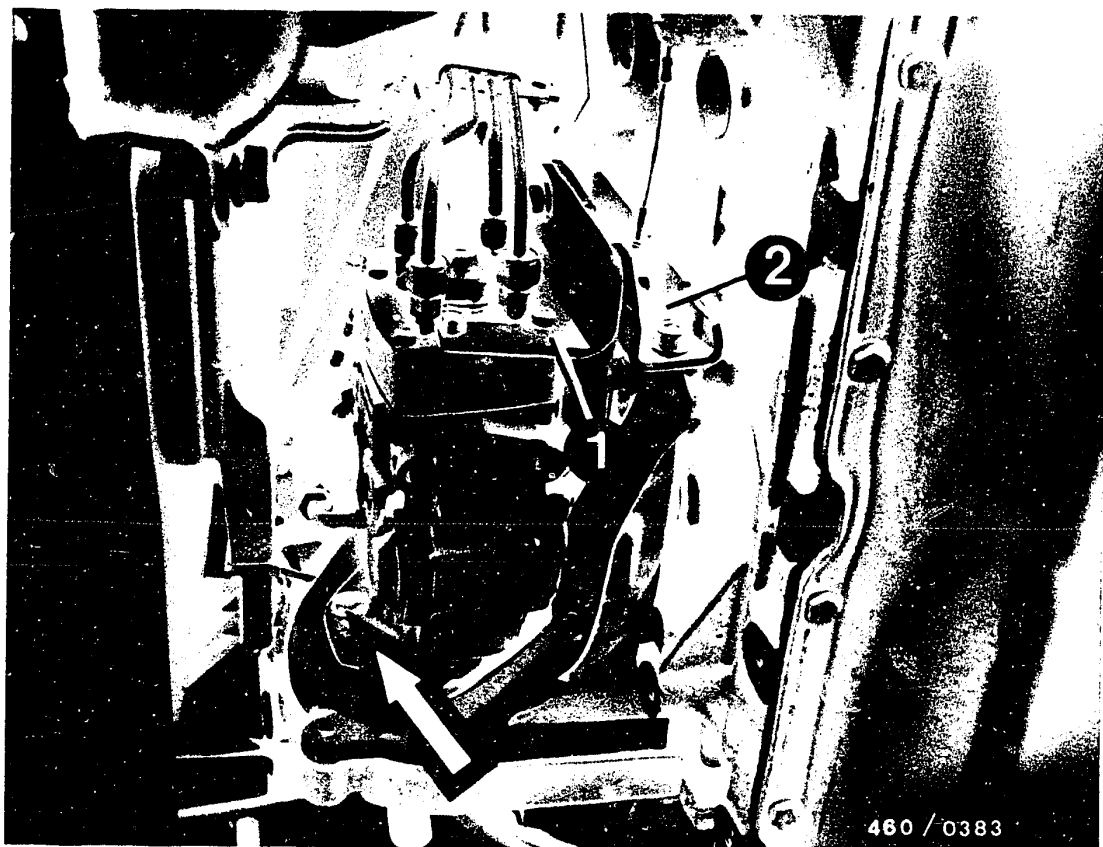




Unscrew fastening screws of support bracket of injection pump (near hydraulic head) (picture a, arrows).

Remove fastening screws of injection pump on pump flange and remove injection pump (picture b, arrows).





## 25. Install fuel-injection pump

Introduce fuel-injection pump into pump flange and tighten fastening screws finger-tight (arrow).

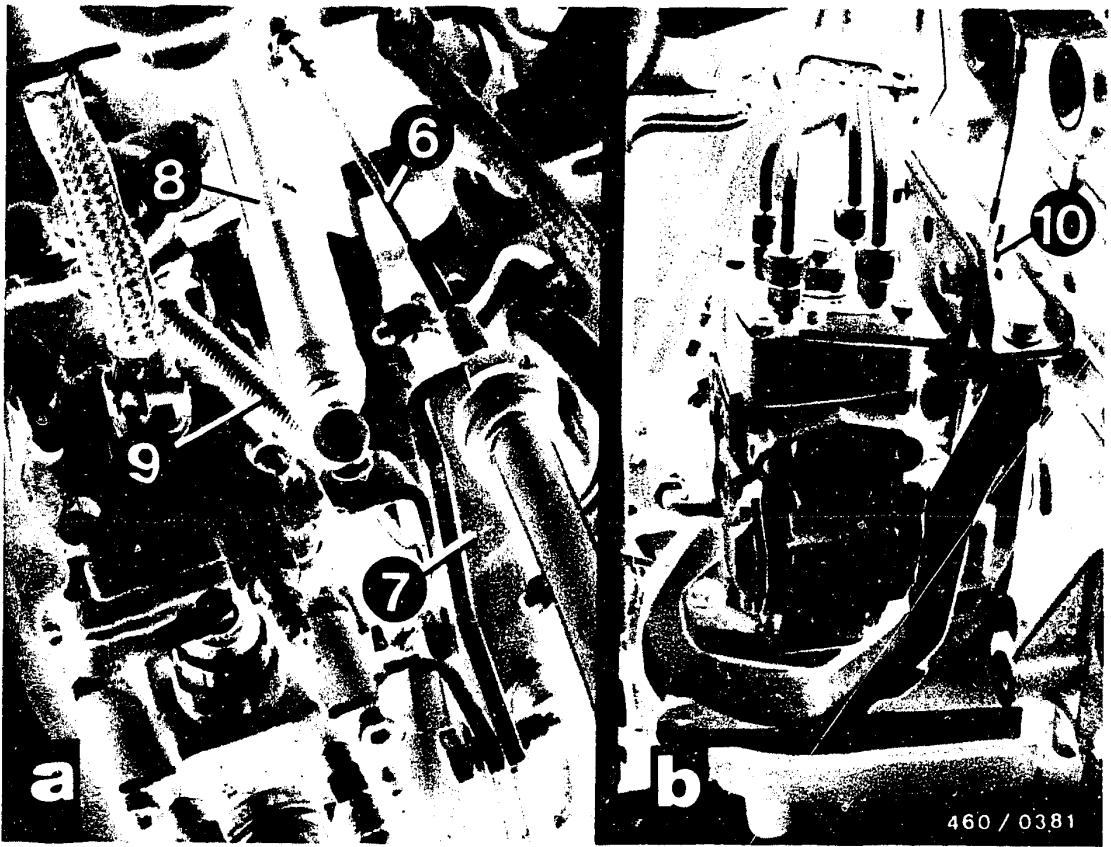
Mount support bracket (1) of hydraulic head on holding bracket (2) of engine.

Tighten fastening screws of support bracket and injection pump to 25 Nm.

**E5**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





Hook accelerator cable (6) into injection pump control lever and into holding bracket (7).

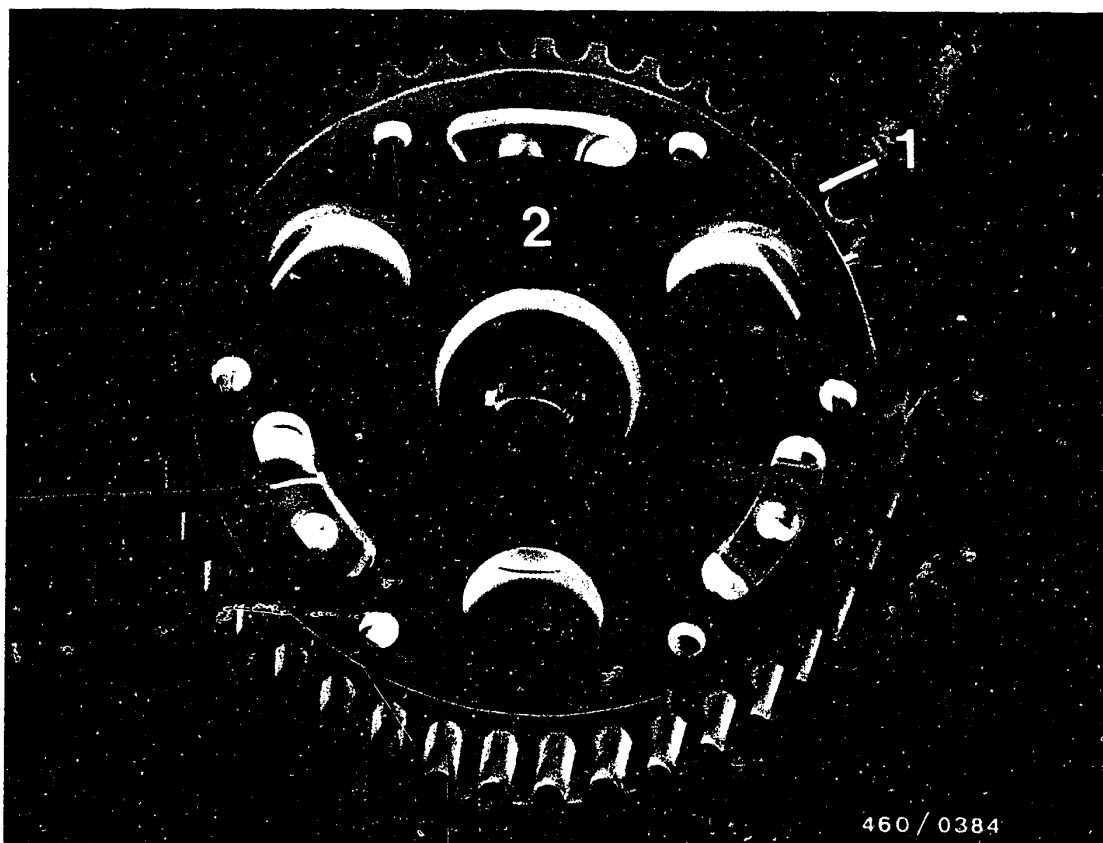
Mount damper (8) and spring (9) on control lever.

Mount cable of cold-start accelerator and secure with securing clamp (10).

**E6**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





1 = Ring gear

2 = Pump hub

Mount pump drive gear on pump drive shaft so that groove in cone of pump hub points to outlet "D" of hydraulic head.

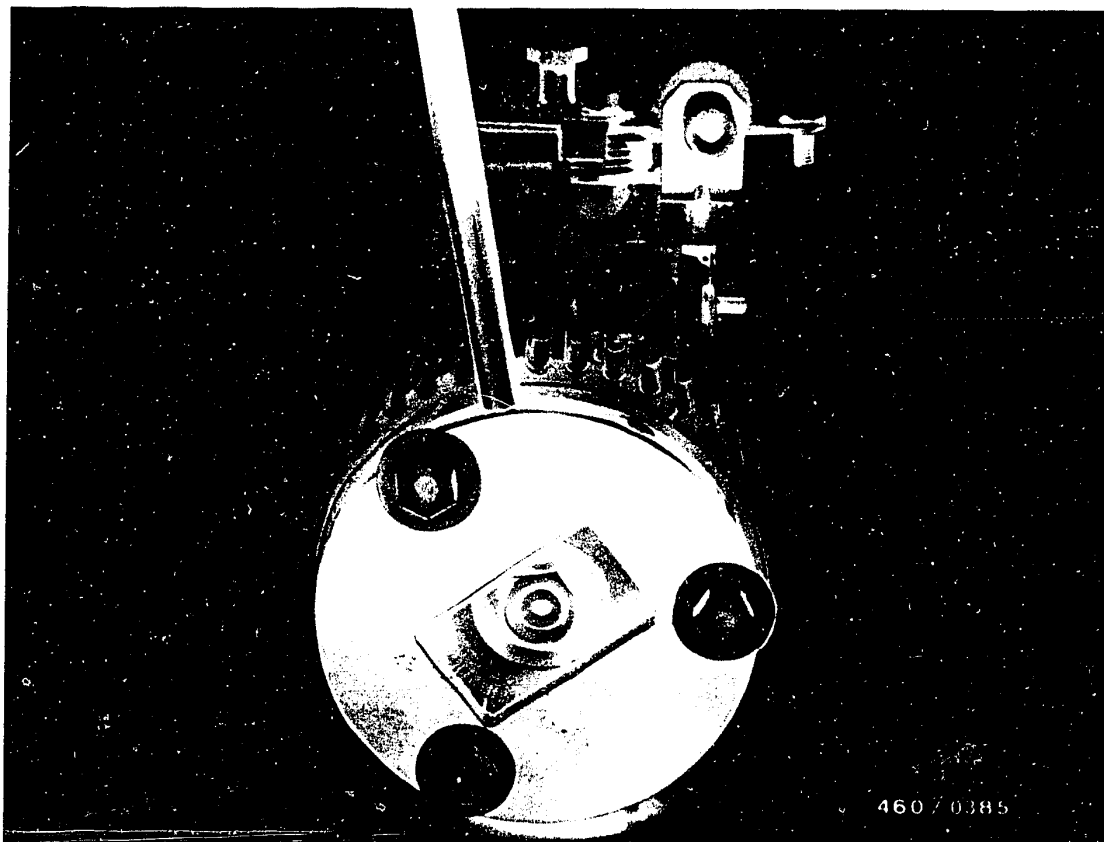
Note:

Threaded holes and slots align only in one position.

**E7**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





Mount plain washer and fastening nut of pump drive gear and finger-tighten.

Mount puller flange KDEP 1135 without puller on pump hub.

Hold puller flange with holding mandrel and tighten pump drive gear to 55 Nm.

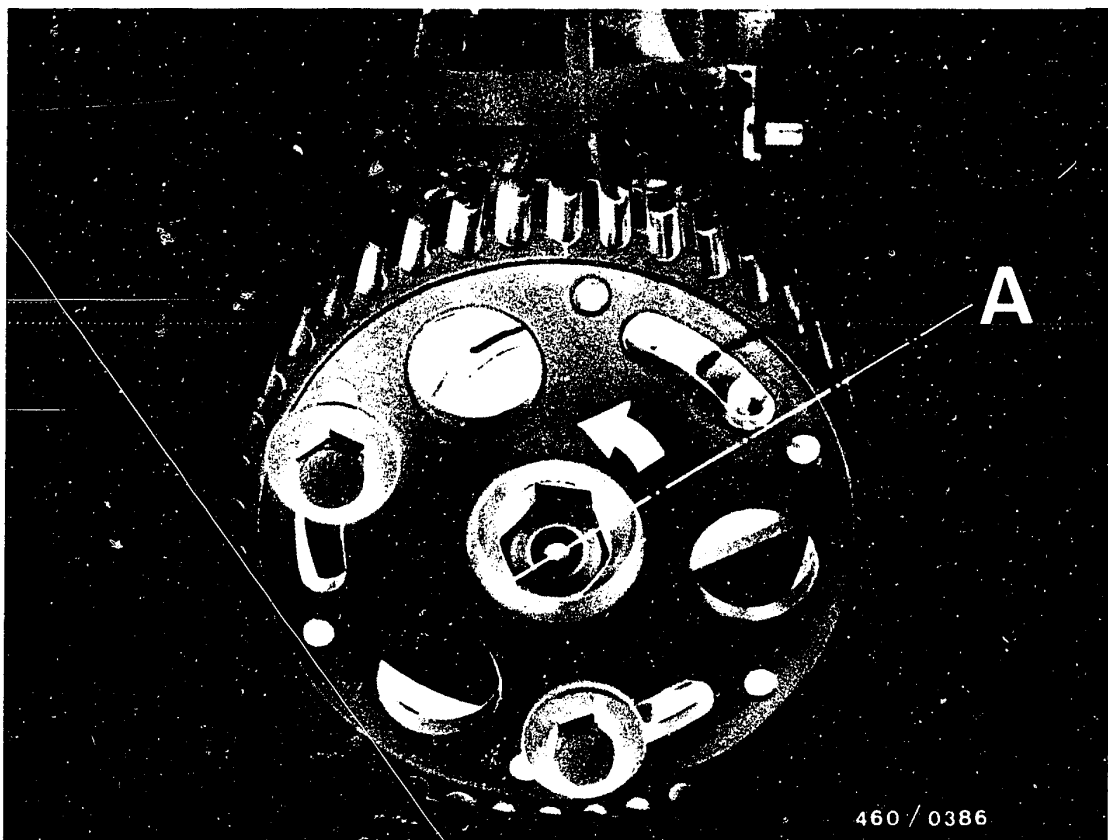
Remove puller flange.

**E8**

Install fuel-injection pump

Opel Ascona/Kadett-Diesel





Mount fastening screws on pump drive gear.

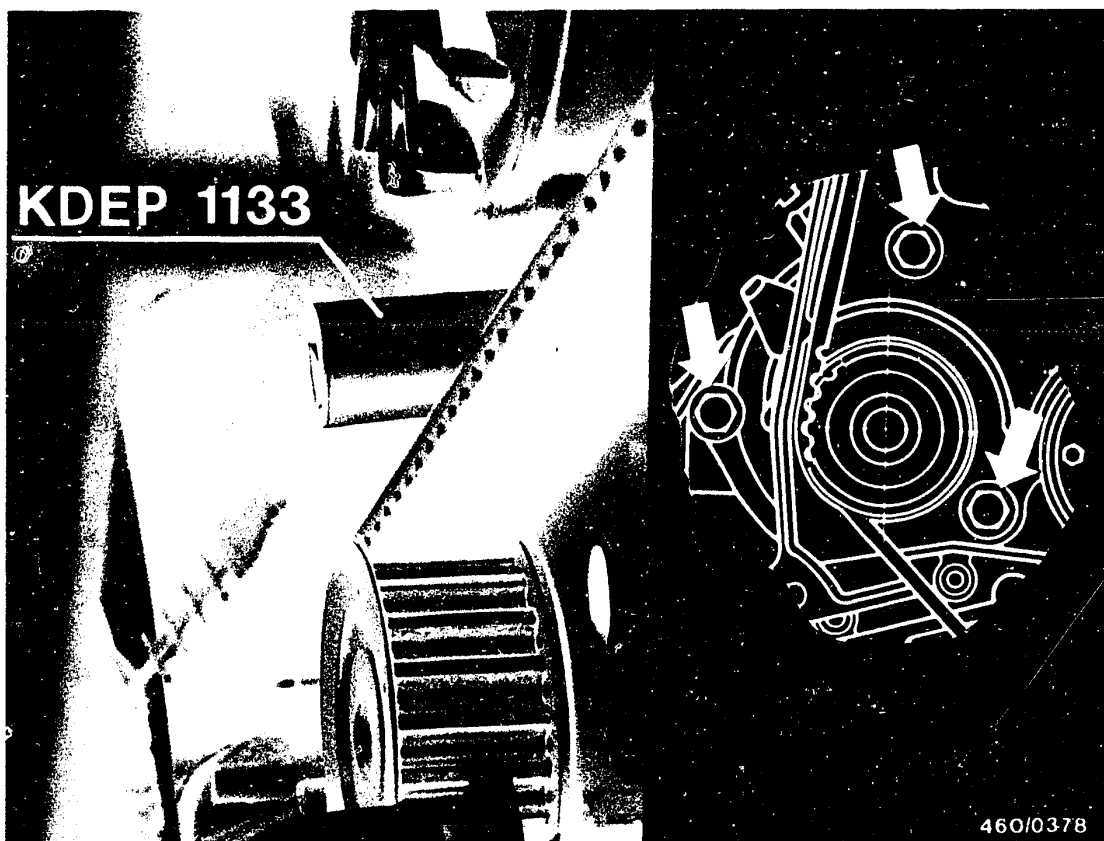
Turn injection pump hub with respect to drive gear in slot to the left as far as stop ("A").

Finger-tighten fastening screws in order to prevent turning during the following operations.

**E9**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





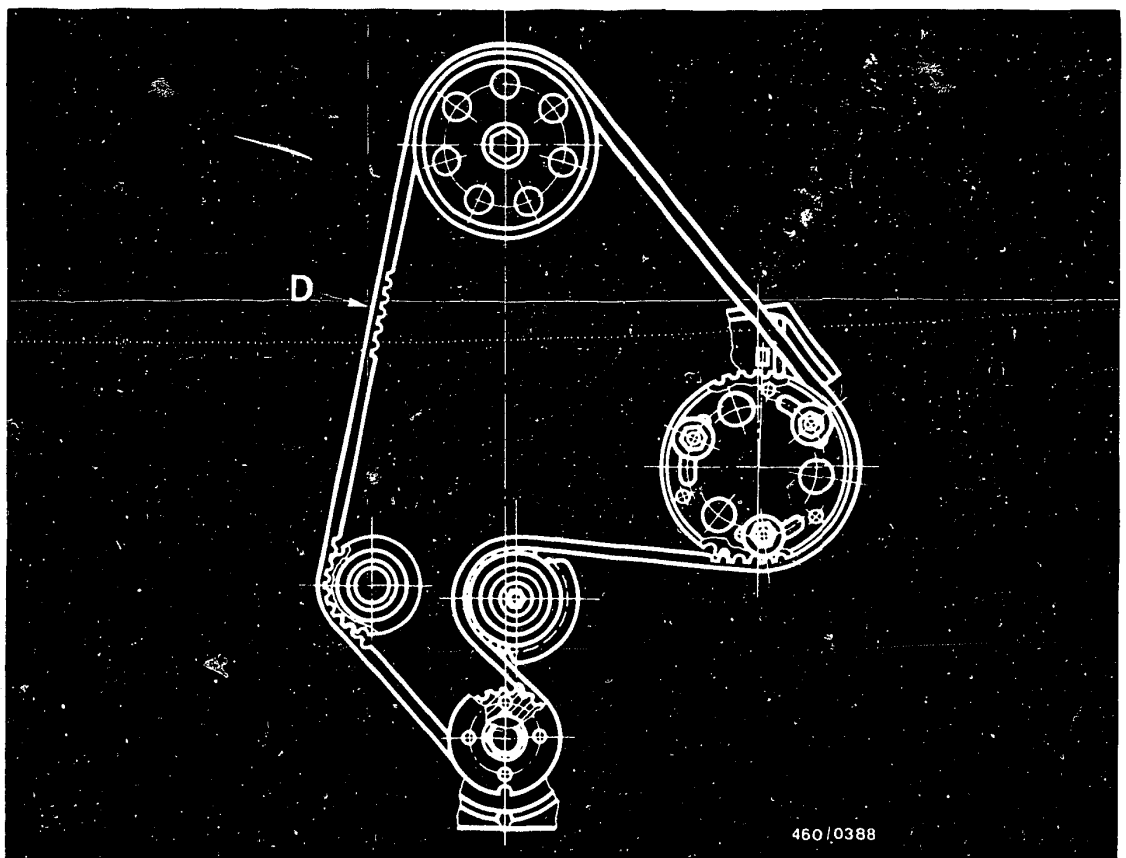
Place toothed belt in position.  
Swivel water pump in clockwise direction using open-end  
wrench KDEP 1133 and tension toothed belt.  
Tighten fastening screws (arrows) of water pump.

**E10**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel







Test tension of toothed belt using belt tension tester KDEP 1121:

Attach toothed-belt tester to the unloaded side of the belt at point "D".

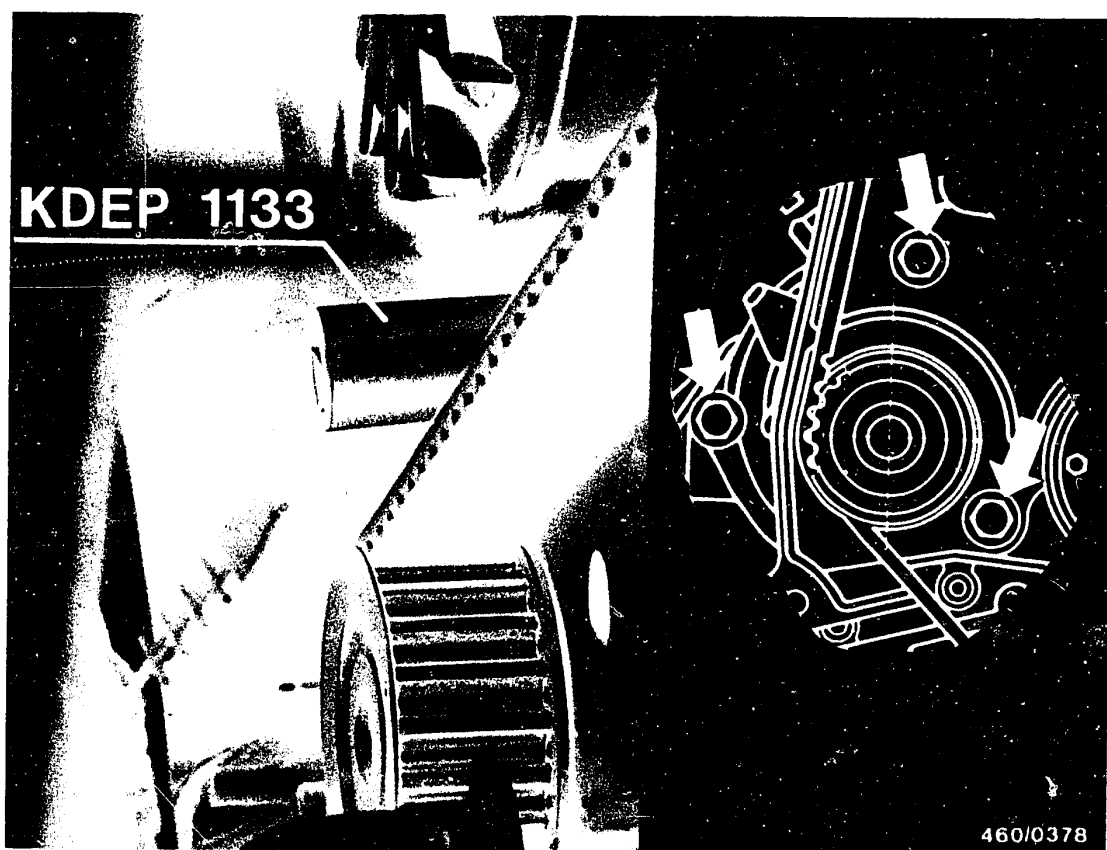
Turn vernier sleeve until bottom edge of sleeve is in alignment with line mark on measuring tongue.  
Make reading:

Set value: Scale value 12 ... 13

**E11**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





If the reading differs from the set value, loosen fastening screws (arrows) of water pump and, using open-end wrench KDEP 1133, swivel water pump in a counter-clockwise direction.

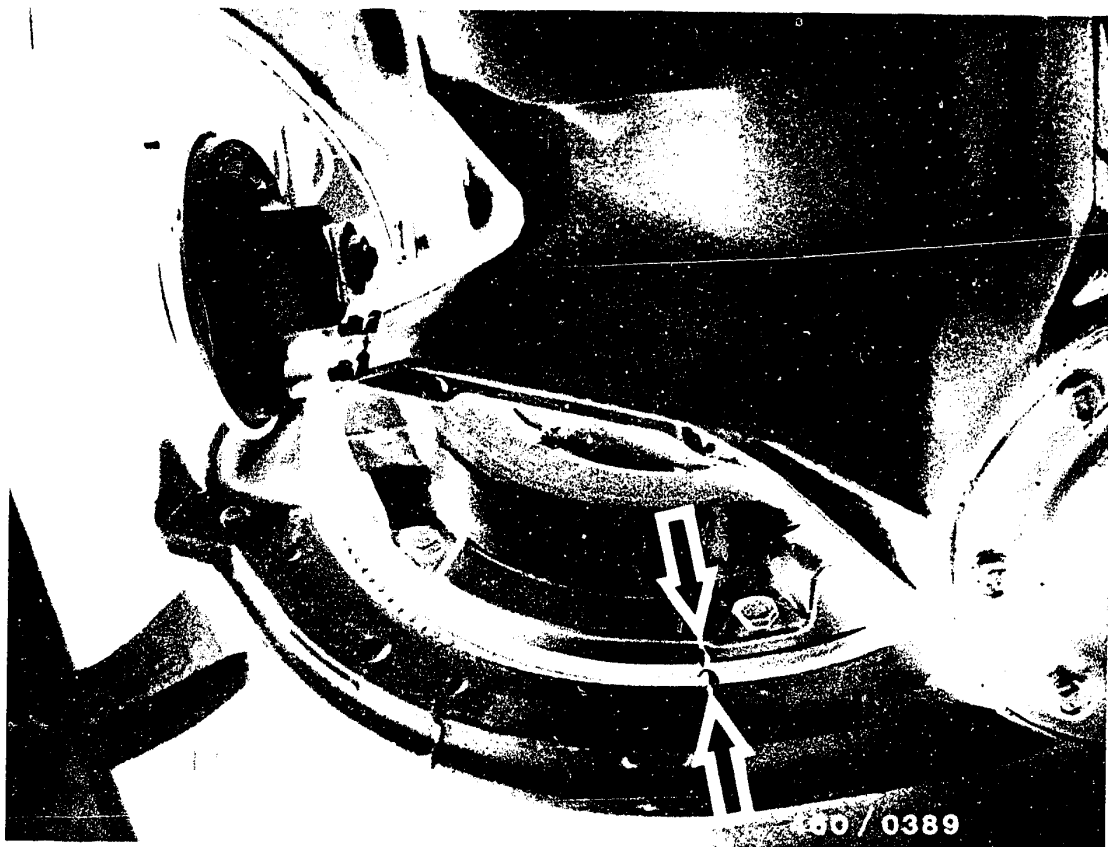
Tighten fastening screws of water pump.

Check tension of toothed belt.

**E12**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





Check whether TDC mark (cylinder 1) on flywheel is in alignment with reference mark (arrow).

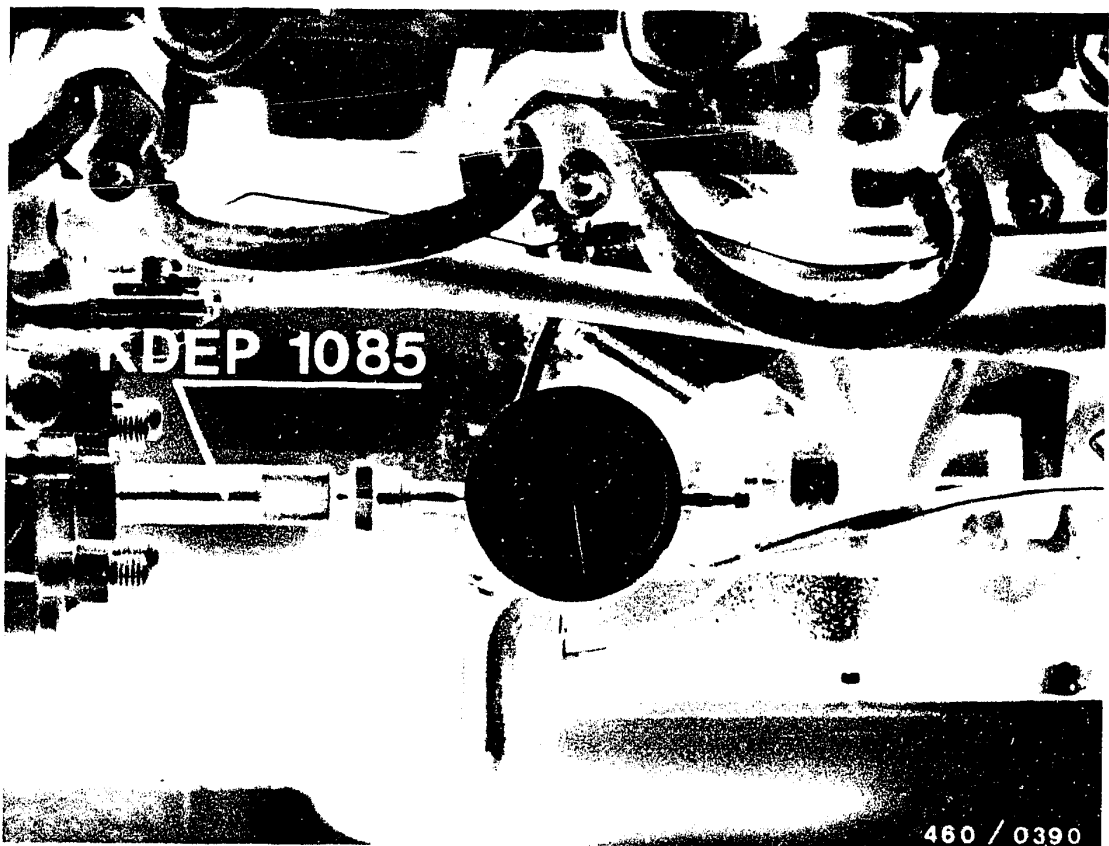
Hold camshaft gear with flat wrench and tighten fastening screw to 90 Nm.

Remove holding device KDEP 1134.

**E13**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





Remove bleeder screw from central screw plug (triangular plug) of hydraulic head.

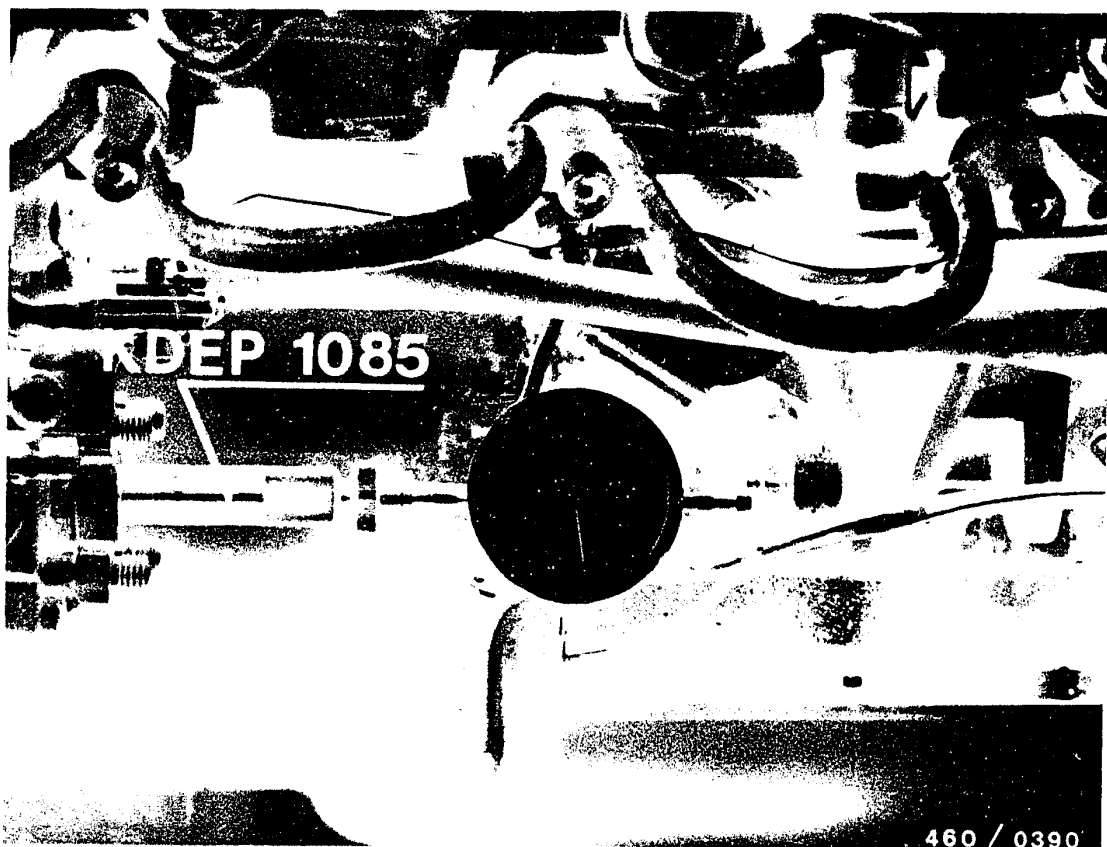
Fit measuring tool KDEP 1085 into tapped hole of bleeder screw.

Mount dial indicator with measuring insert in measuring tool KDEP 1085.

Caution:

The cold-start accelerator (KSB) must be in the zero position when testing and setting the start of delivery.





Preload dial indicator by approx. 2.5 mm.  
 Slowly turn crankshaft against direction of rotation of engine until pointer of dial indicator no longer moves.  
 Preload dial indicator by approx. 1 mm and set to "zero".

Turn crankshaft in direction of rotation of engine until TDC mark on flywheel is in alignment with reference mark.

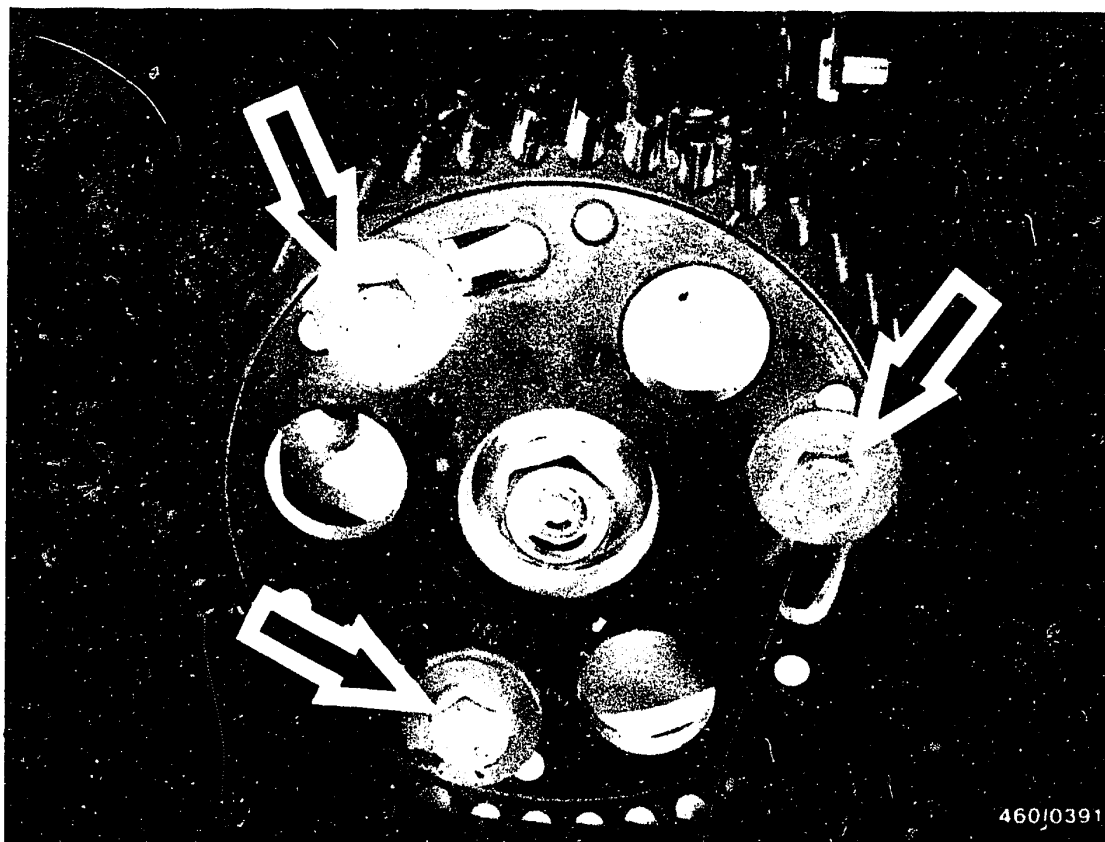
In this position, the dial indicator must indicate a stroke of

$1.0 \pm 0.05$  mm after BDC ( $\rightarrow 8.85$ )

$0.9 \pm 0.05$  mm after BDC ( $9.85 \rightarrow$ )

0.95 mm after BDC when there are cold-starting problems.



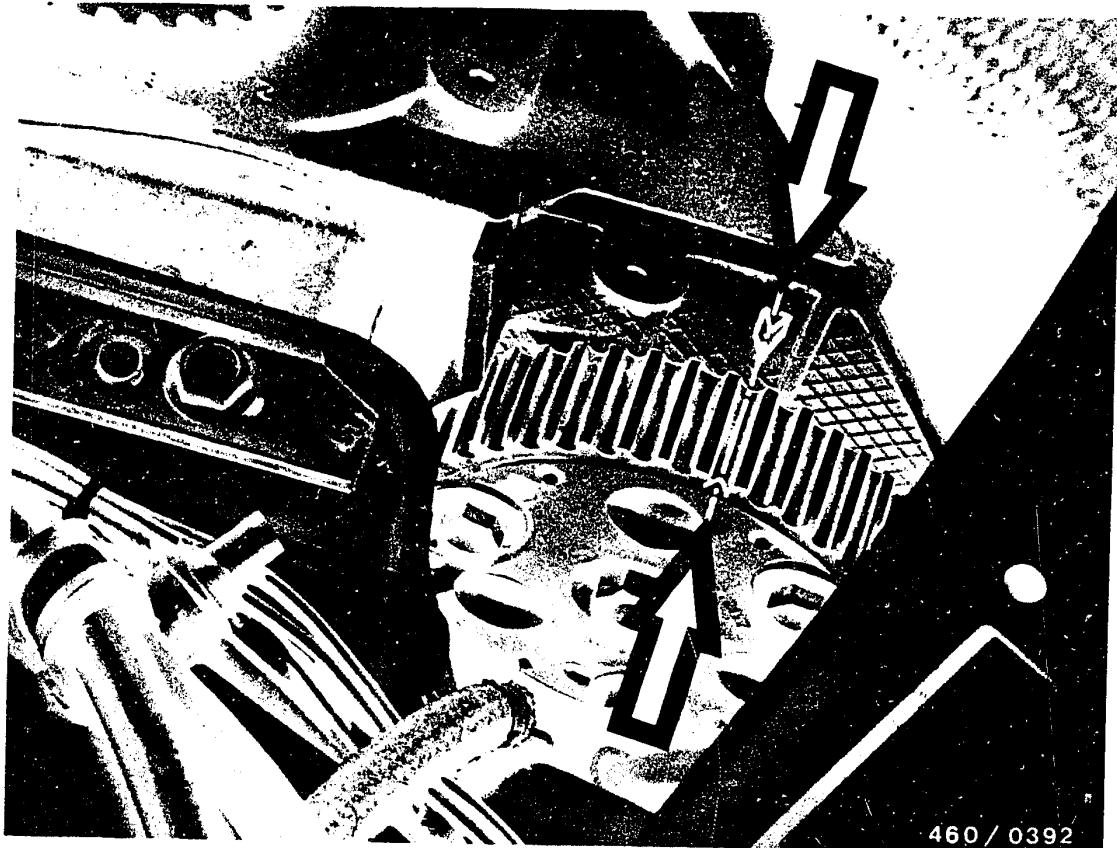


If it is necessary to make an adjustment, loosen fastening screws (arrows) of pump hub.

**E16**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





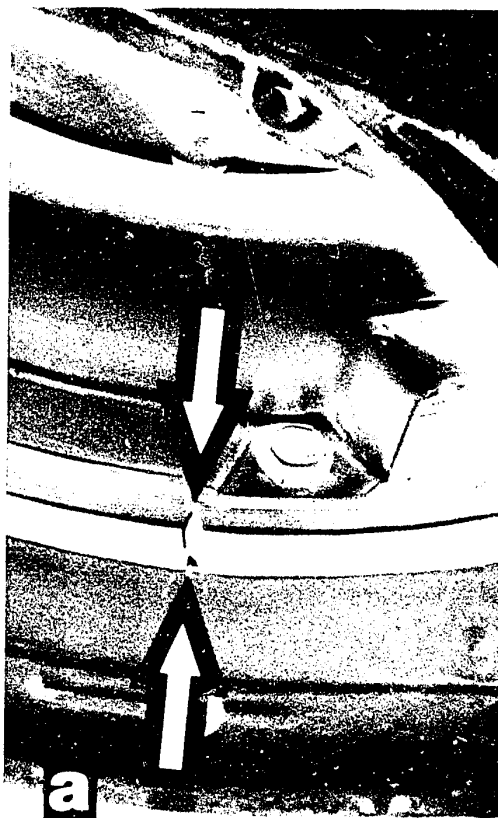
Turn ring gear so that markings on injection pump gear and pump bracket are in alignment (picture b).

Check whether TDC mark (cylinder 1) on flywheel is in alignment with reference mark (picture a).

**E17**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





The fuel-injection pump is set at the two-part pump drive gear.

The mark for cylinder 1 (arrow - pump gear) is on the pump drive gear.

When this mark is in alignment with the mark on the pump flange (top arrow) the injection pump is at outlet "D" (cylinder 1).

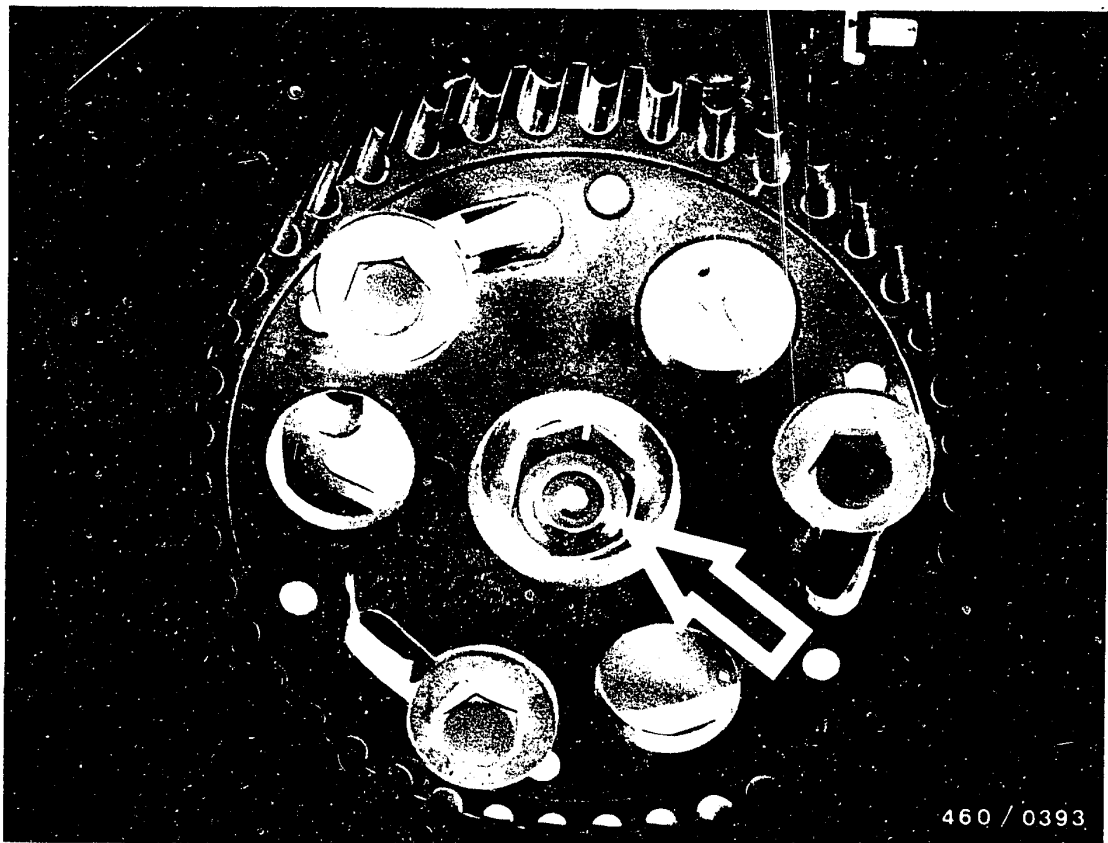
**E18**

Install fuel-injection pump

Opel Ascona/Kadett-Diesel







Place box wrench on fastening nut (arrow) of pump drive shaft.

Turn pump drive shaft with pump hub until a stroke of  $1.0 \pm 0.05$  mm after BDC ( $\rightarrow 8.85$ )

$0.9 \pm 0.05$  mm after BDC ( $9.85 \rightarrow$ )

$0.95$  mm after BDC when there are cold-starting problems is obtained. Tighten fastening screws of pump hub to 25 Nm.

Marks on injection pump gear and pump bracket must align.

Turn crankshaft over twice and check setting.

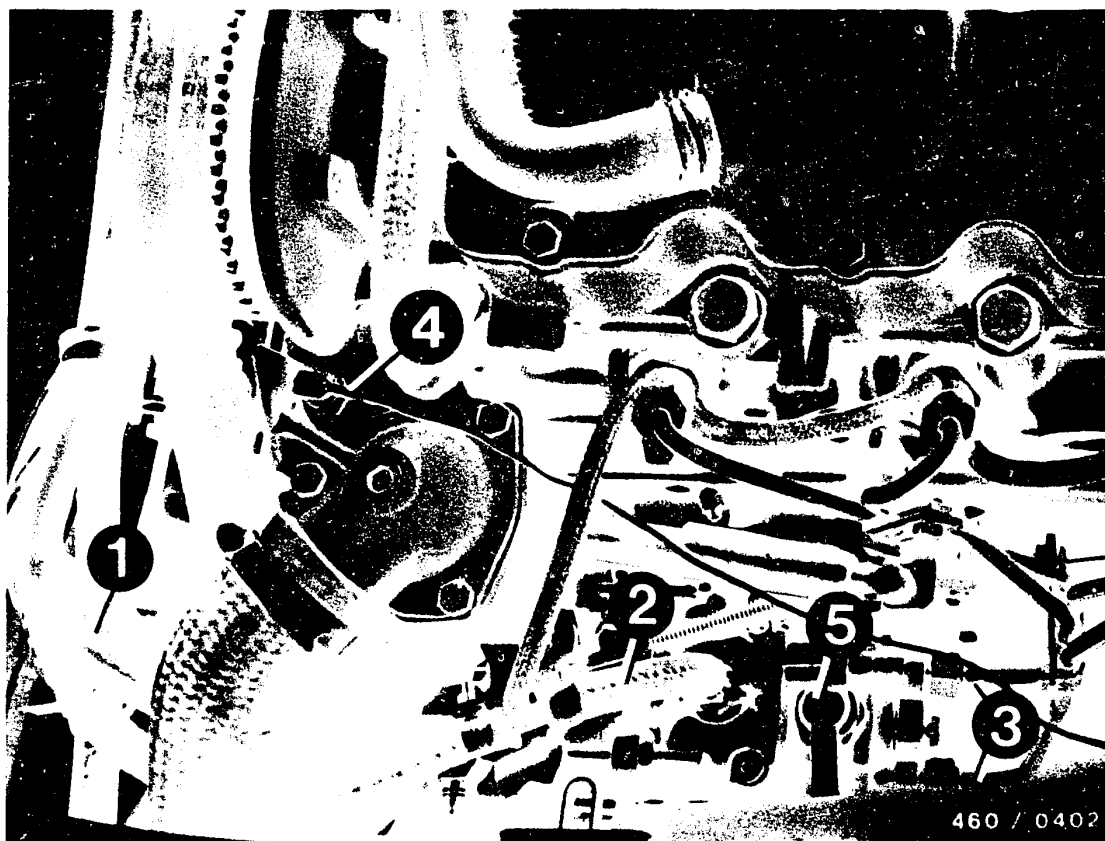
Remove measuring tool KDEP 1085 with dial indicator.  
Mount bleeder screw with new seal ring.

**E19**

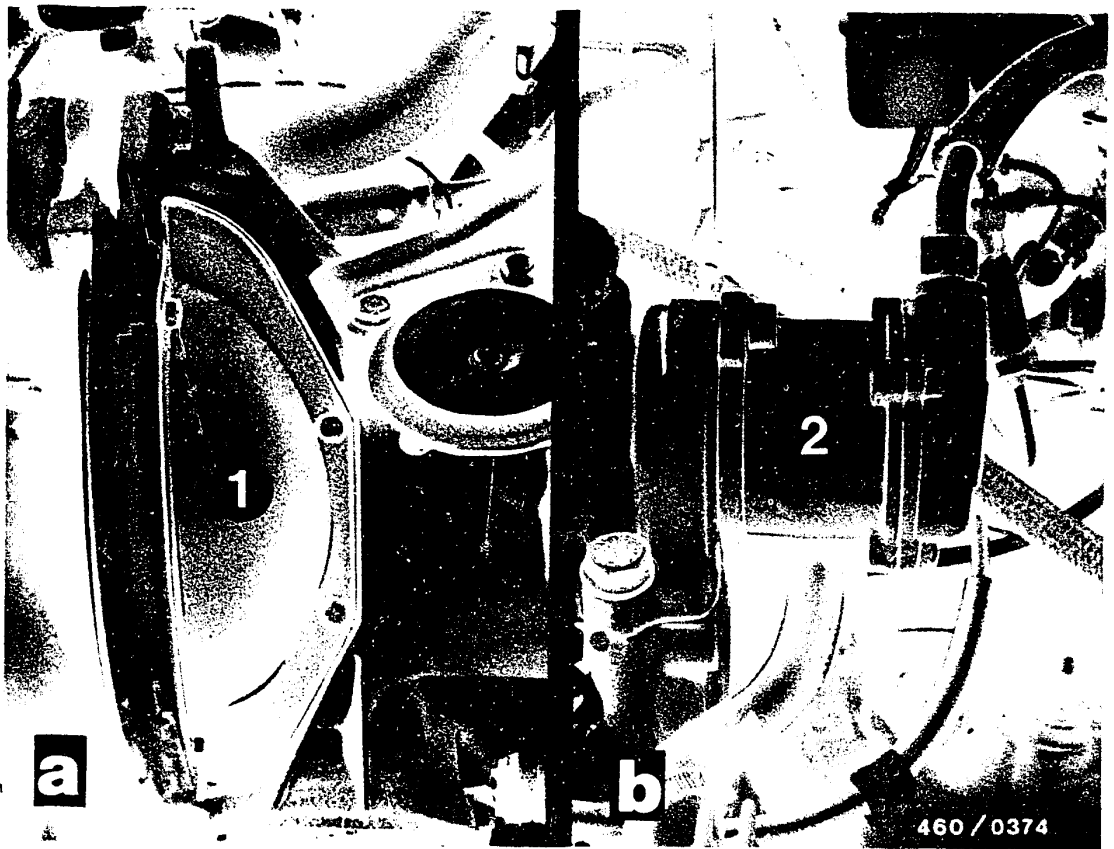
Install fuel-injection pump

Opel Ascona/Kadett-Diesel





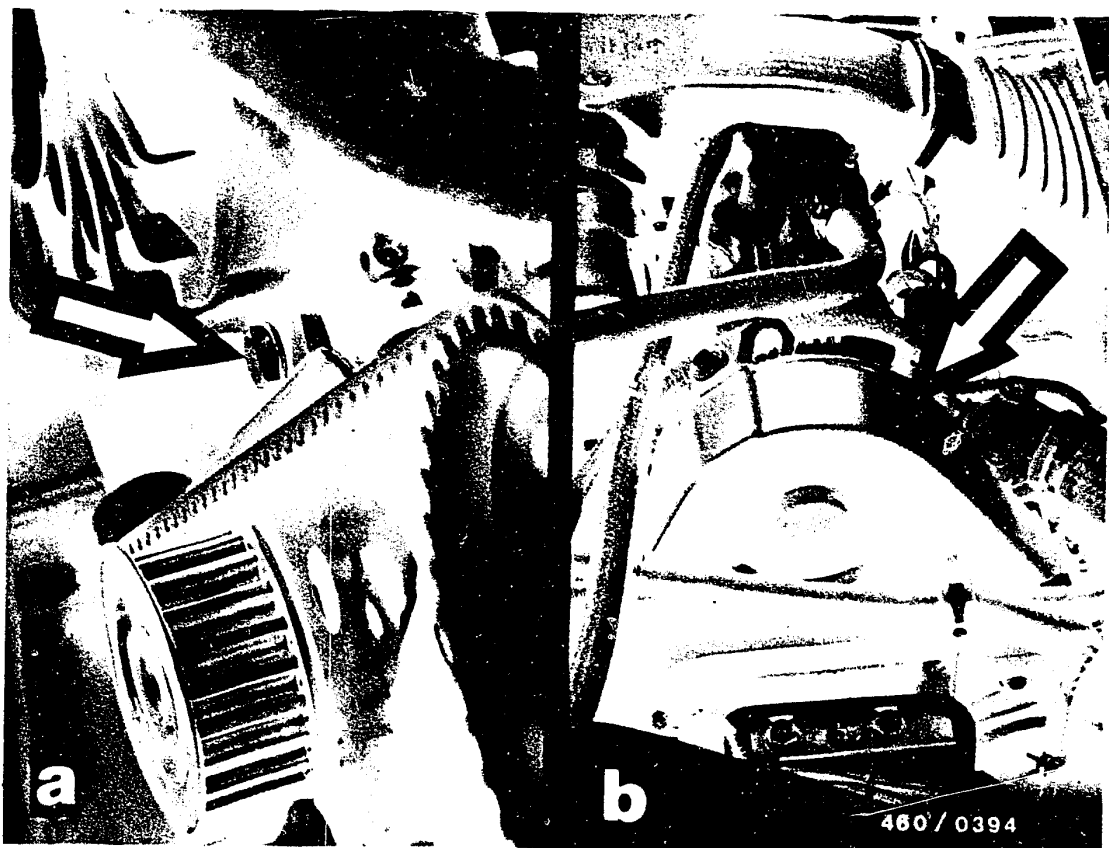
Mount fuel inlet line (1) and fuel return line (2), fuel-injection tubing (3) and electric lead (4) on thermo-switch and shutoff solenoid (5).



Mount vacuum pump (2) with oil supply tube and driver on camshaft housing.

Mount cylinder head cover.

Mount cover on clutch housing (1).



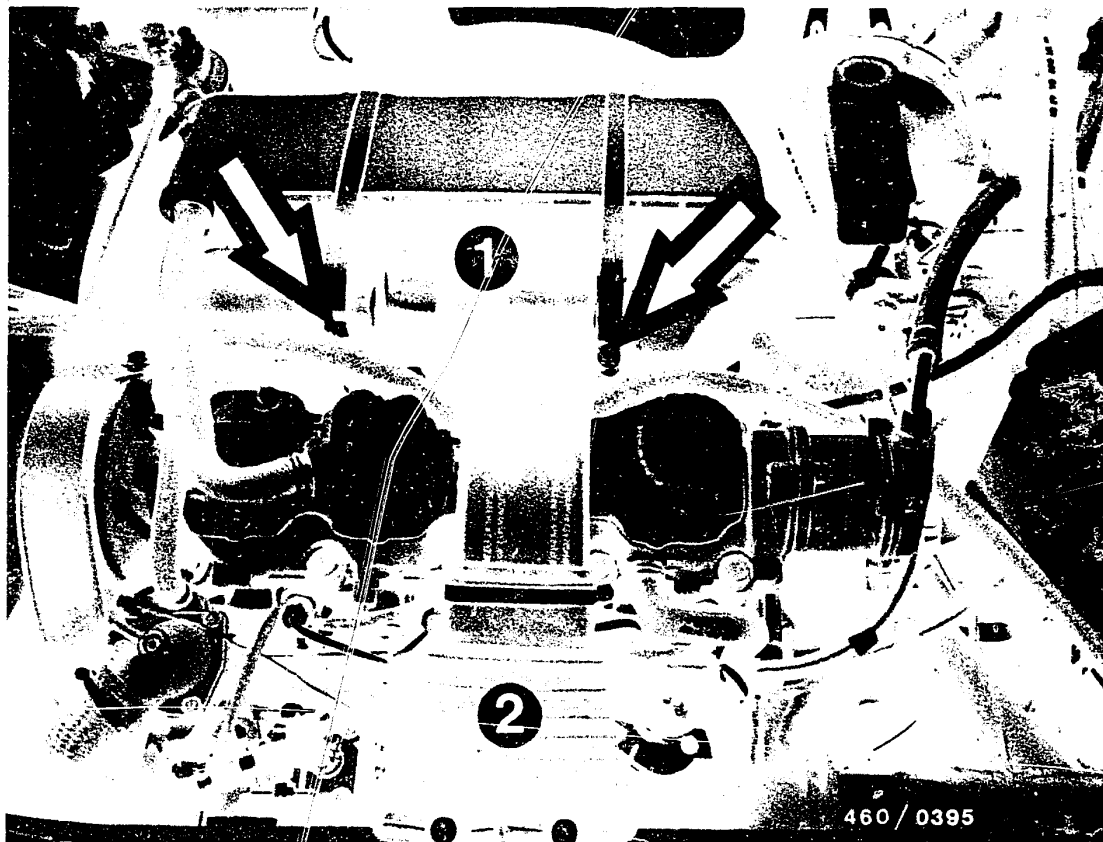
Position V-belt and tension (picture a, arrow).

Screw down upper and lower toothed-belt covers (picture b).

**E22**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





Mount hose connector on upper toothed-belt cover.

Insert air-filter housing (1) and fasten with retaining bands (arrows).

Mount pipe and air-intake dome (2).

Connect negative cable to battery.

Bleed fuel-injection system.





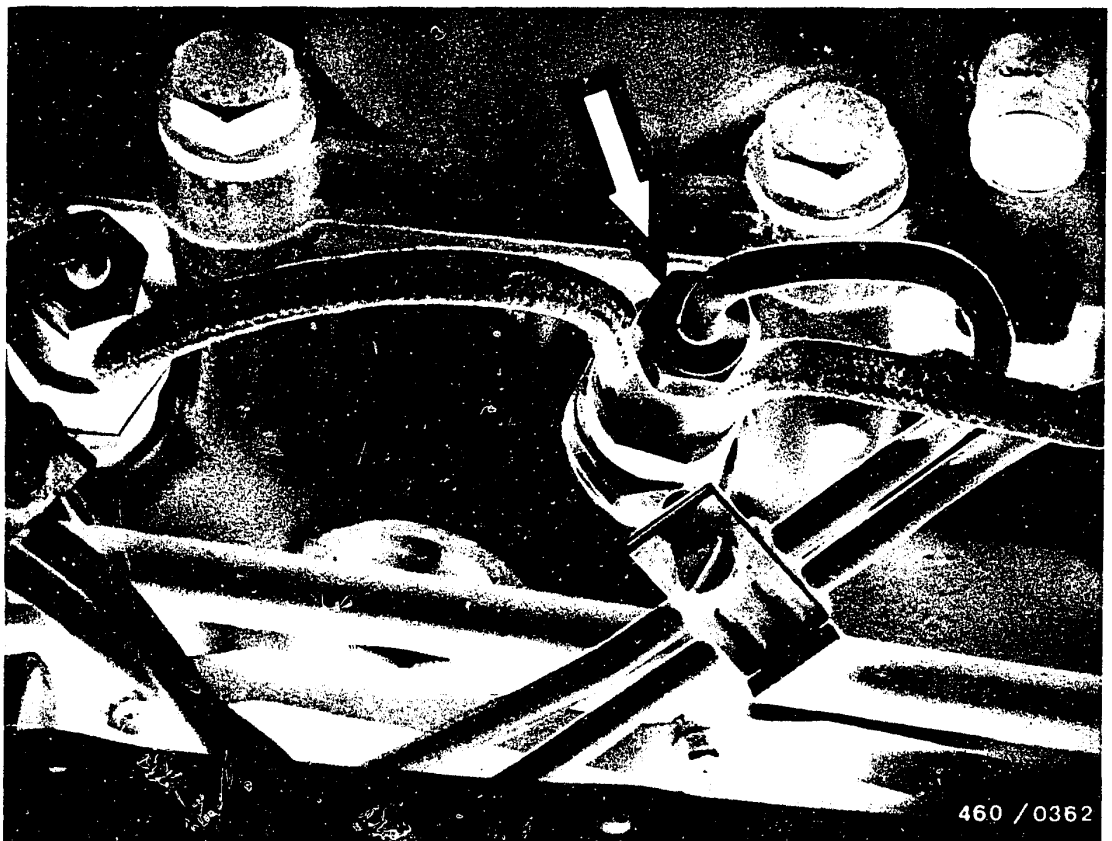
### 25.1 Bleed fuel system

Fill up fuel filter and fuel-injection pump with diesel fuel.

Close bleeder screw on fuel filter (picture a, arrow).

Loosen bleeder screw on fuel-injection pump and unscrew by a few turns (picture b, arrow = view from below).





Loosen union nuts (arrow) of fuel-injection tubing on nozzle-holder assemblies.

Actuate starting motor without pre-heating. When the fuel escaping from the bleeder hole in the injection pump is free of bubbles tighten the bleeder screw.

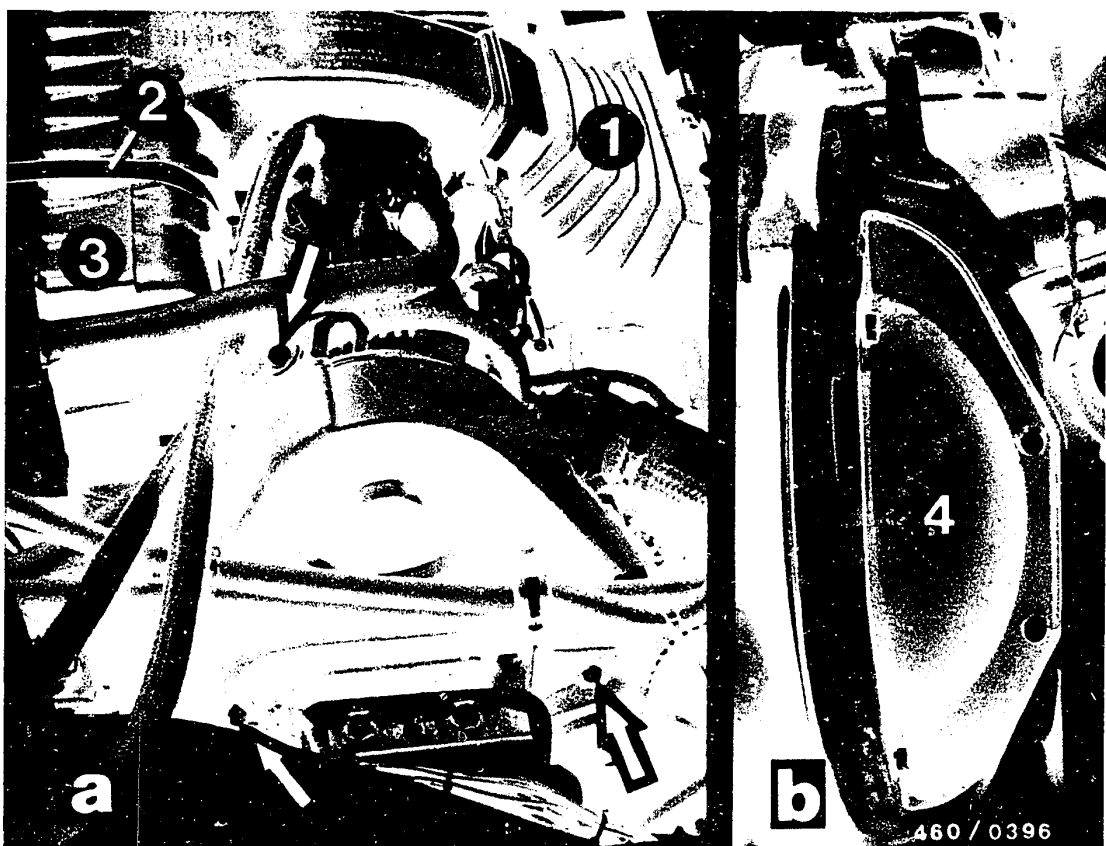
Continue to actuate starting motor until fuel escapes at union nuts of nozzle-holder assemblies. Tighten union nuts.

Actuate starting motor until engine starts.

**F1**

Install fuel-injection pump  
Opel Ascona/Kadett-Diesel





## 26. Check and adjust engine timing

### 26.1 Check engine timing

Disconnect negative cable from battery. Remove pipe between air-intake dome (1) and intake manifold.

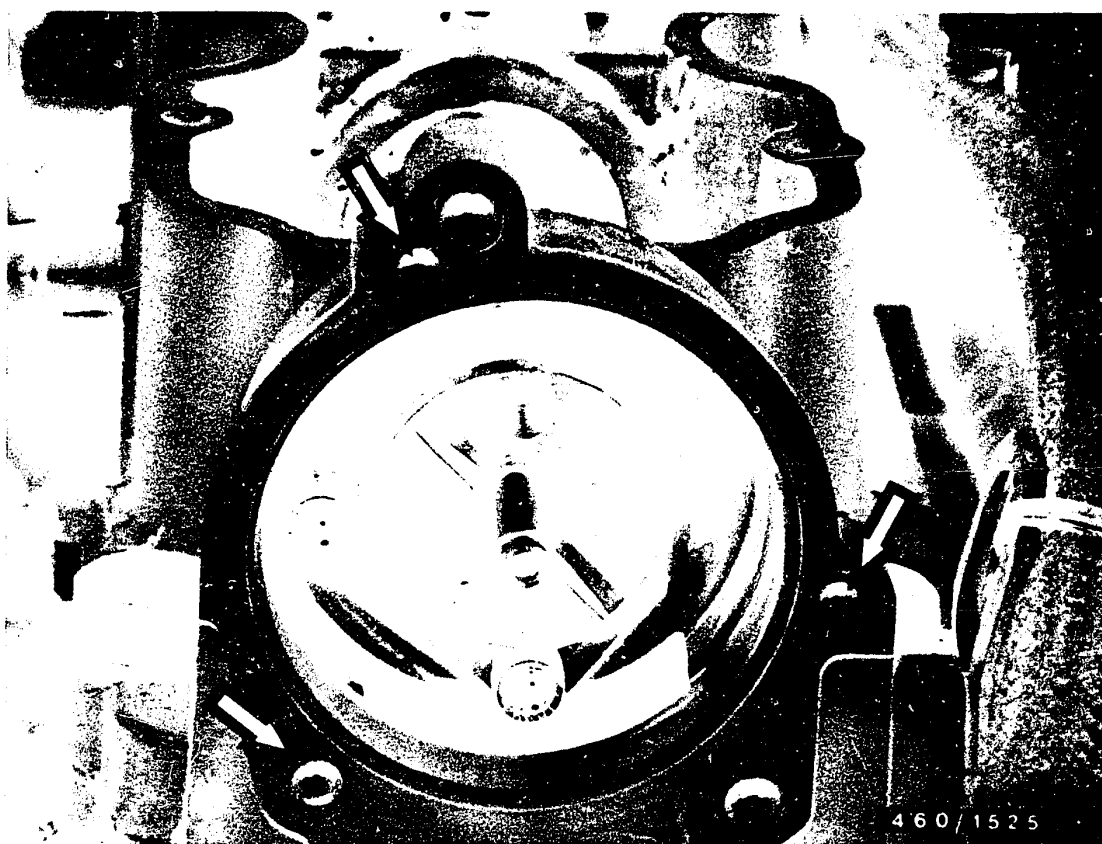
Loosen retaining bands (2) on air-filter housing and remove air-filter housing (3).

Loosen alternator belt-adjustment link and take off V-belt.

Remove upper and lower toothed-belt covers (arrows). Remove cover (4) on clutch housing.







Note on testing and adjusting of engine timing

As from the 85 model, the locating bores (arrows) in the camshaft housing are no longer present.

Locking of the camshaft with holding device KDEP 1134 is not possible with this engine version.

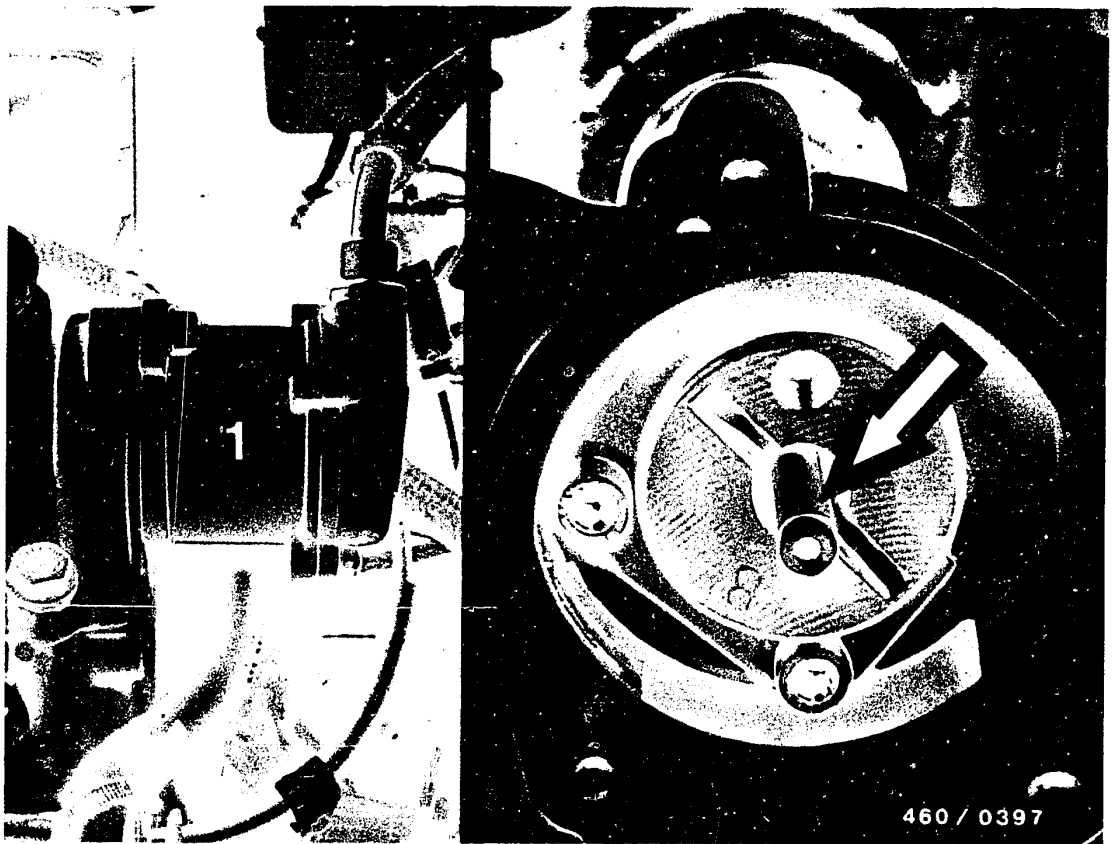
Remove vacuum pump to see if bores are present.

If bores are not present, adjust engine timing with measuring rail KDEP 1155 in accordance with coordinate F11.

**F3**

Check and adjust engine timing  
Opel Ascona/Kadett-Diesel





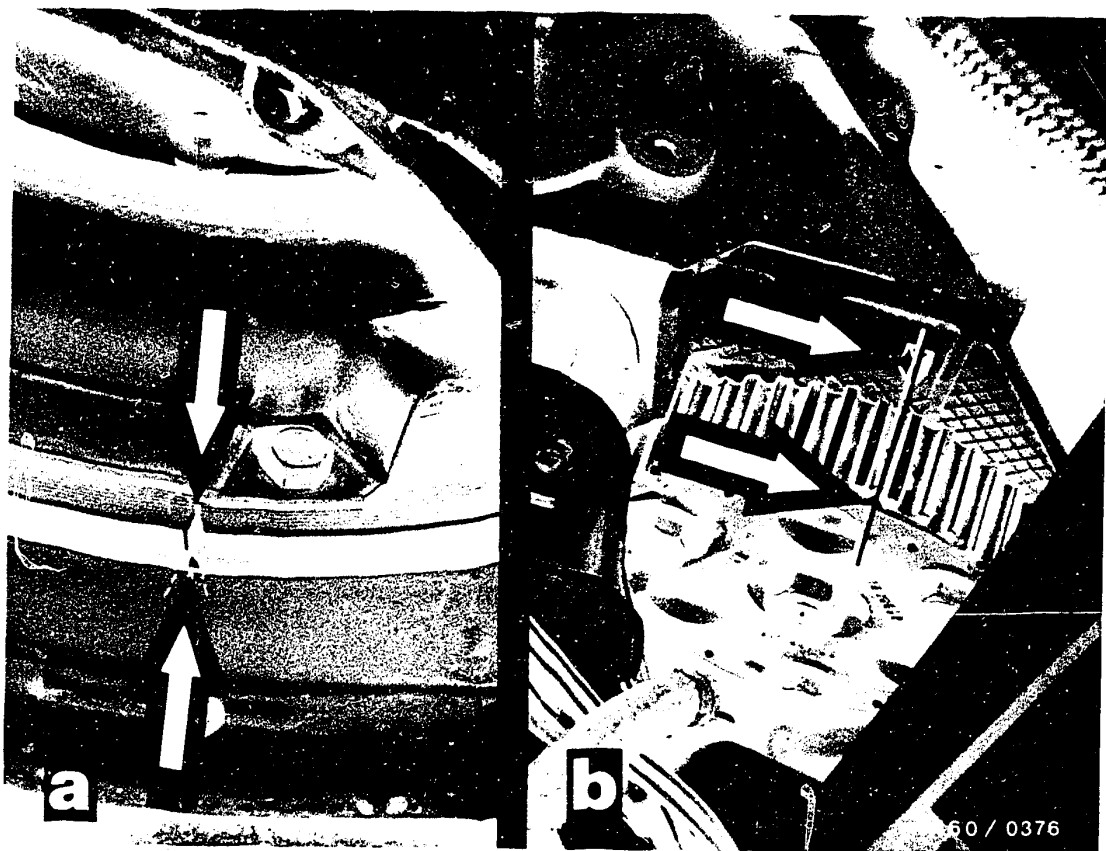
Remove vacuum pump (1) from camshaft housing.

Remove driver and oil supply line (arrow).

**F4**

Check and adjust engine timing  
Opel Ascona/Kadett-Diesel





Turn crankshaft in direction of rotation of engine until mark on flywheel is opposite pointer on clutch housing (picture a).

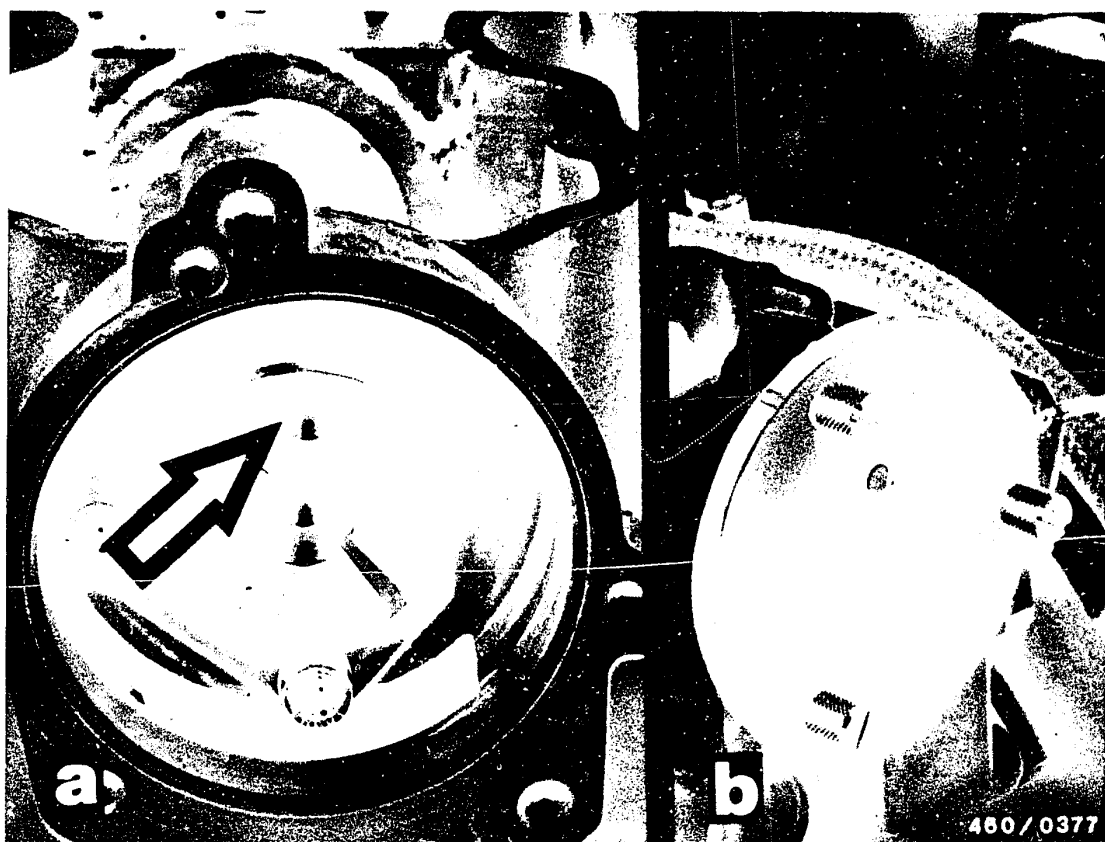
Piston of cylinder 1 is at TDC; valves of cylinder 4 are on overlap.

Mark on pump drive gear points to fixed mark on pump bracket (picture b).

**F5**

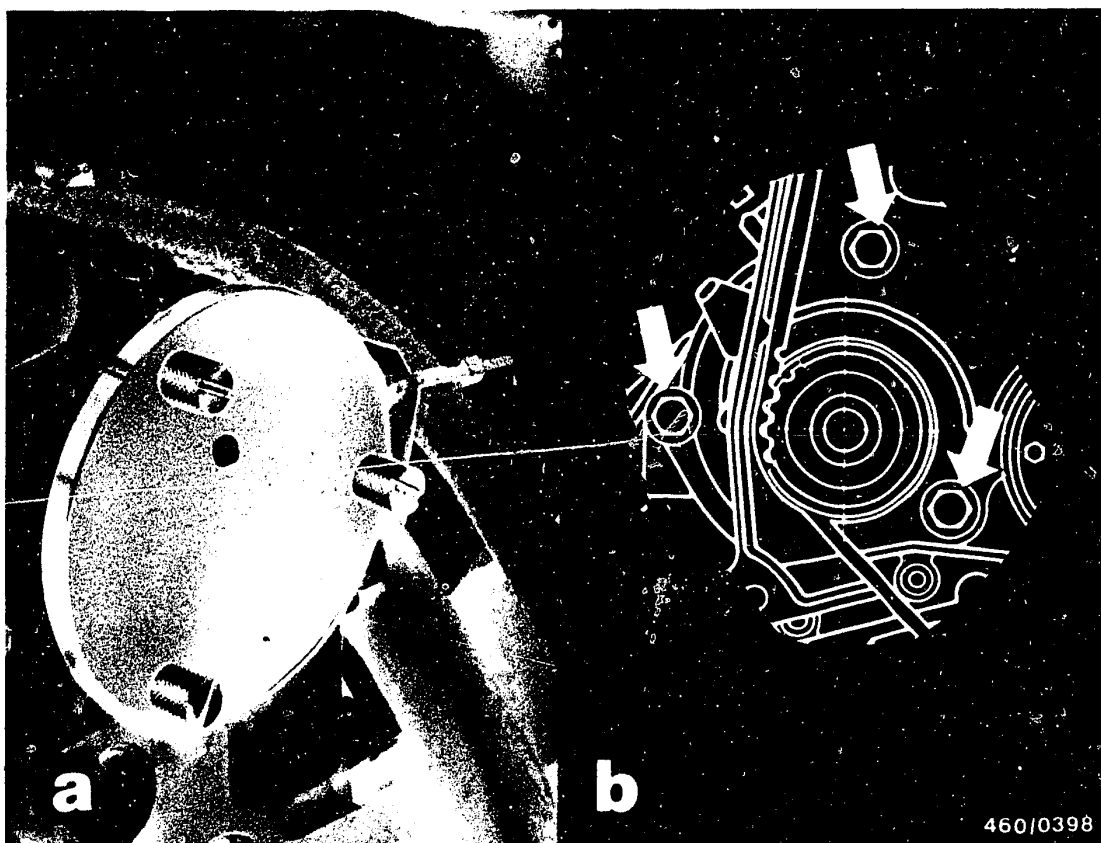
Check and adjust engine timing  
Opel Ascona/Kadett-Diesel





Slide locating pin of holding device KDEP 1134 free of tension into bore (arrow) of camshaft and mount holding device.

If the holding device cannot be inserted, adjust the engine timing.



460/0398

## 26.2 Adjust engine timing

Turn crankshaft so that holding device KDEP 1134 can be inserted (picture a).

Loosen fastening screw of camshaft gear. To do this, counterhold with single-head engineers wrench at hexagon of camshaft.

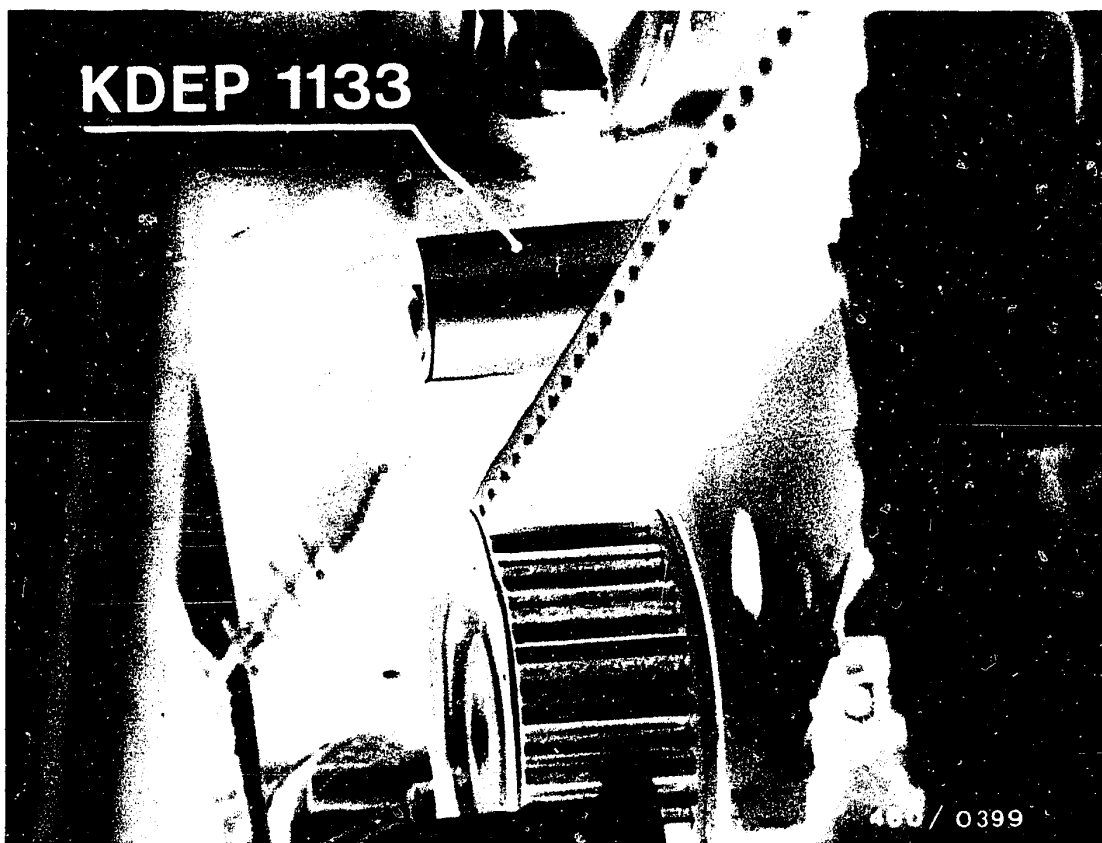
Loosen fastening screws (arrows) of water pump.

**F7**

Check and adjust engine timing  
Opel Ascona/Kadett-Diesel



## KDEP 1133



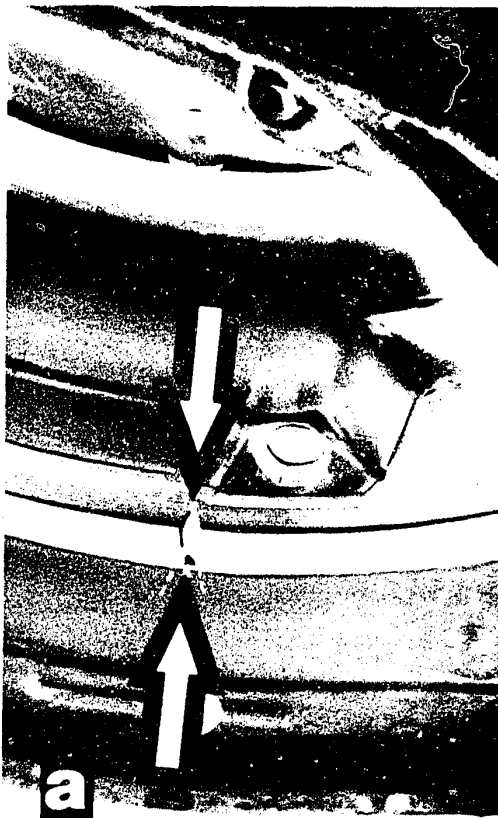
Using open-end wrench KDEP 1133, swivel water pump in counterclockwise direction.

Relax toothed belt and remove.

**F8**

Check and adjust engine timing  
Opel Ascona/Kadett-Diesel





Turn injection pump gear so that marks on injection pump gear and pump bracket are in alignment (picture b).

Turn crankshaft until TDC mark (cylinder 1) on flywheel is in alignment with reference mark (picture a).

**F9**

Check and adjust engine timing  
Opel Ascona/Kadett-Diesel



Place toothed belt in position.

Pivot water pump with single-head engineers wrench KDEP 1133 in clockwise direction and tension toothed belt.

Tighten fastening screws of water pump.

Counterhold camshaft gear with flat-type wrench and tighten fastening screw to 90 Nm.

Check toothed belt tension.

Remove holding device KDEP 1134 from the camshaft.

Subsequent procedure follows as from coordinate F14.

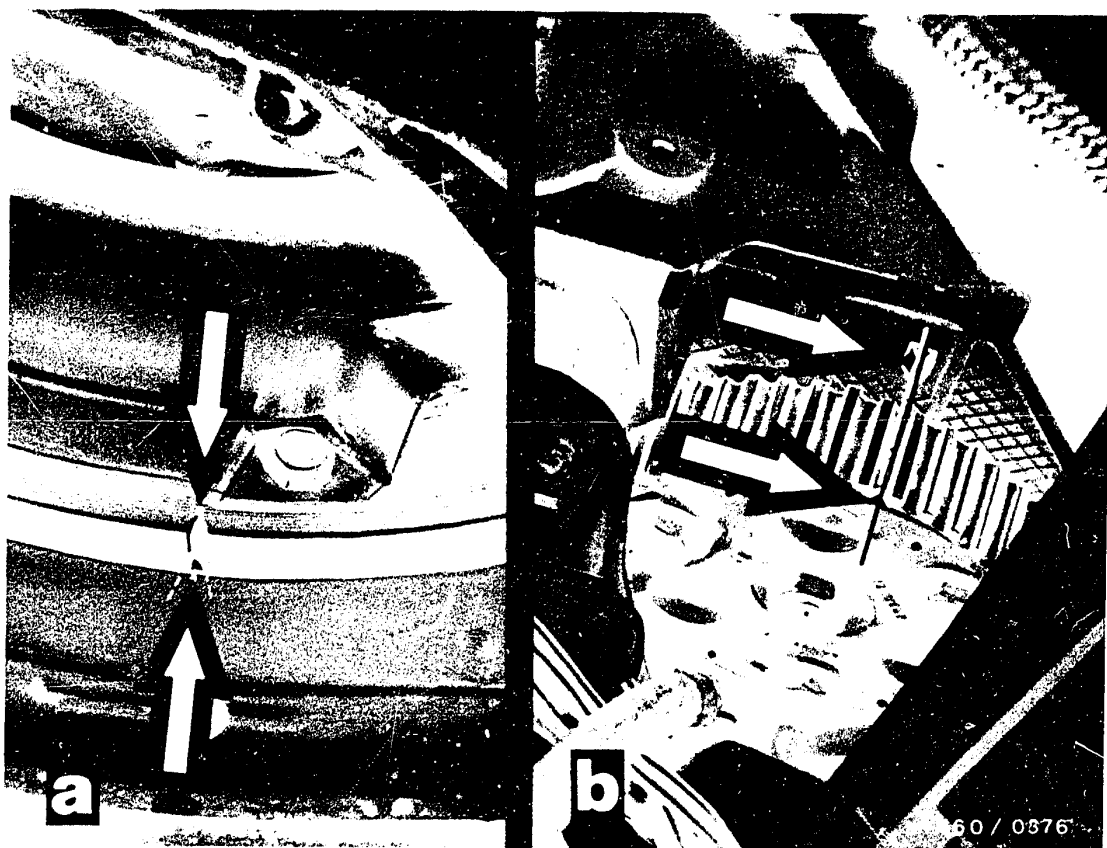
**F10**

Check and adjust engine timing

Opel Ascona/Kadett-Diesel







## 26.3 Test and adjust engine timing with measuring rail

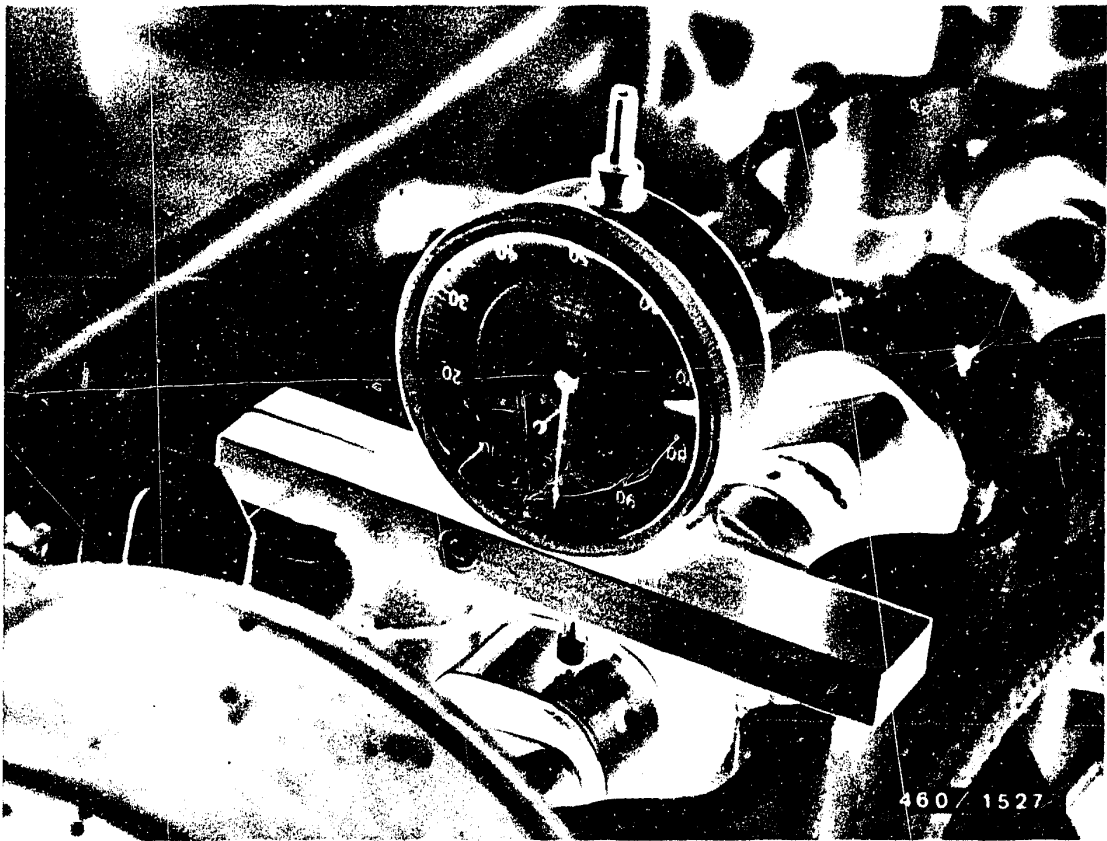
### 26.3.1 Test engine timing

Turn crankshaft in direction of rotation of engine until the mark on the flywheel aligns with the reference mark on the clutch housing (Fig. a).

The piston of cylinder 1 is at TDC, the valves of cylinder 4 are on overlap.

At the same time, the mark on the pump drive gear points to the fixed mark on the pump mounting (Fig. b).





Position measuring rail KDEP 1155 with dial indicator and measuring foot of approx. 10 mm dia. on camshaft housing (see Fig.).

Position dial indicator on the base circle of cam 2 (intake valve of cyl. 1) and set dial indicator to "0" using reversing switch.

Move measuring rail 10 mm in the direction of the cam lobe.

In this position, the dial indicator must indicate a cam lift of 0.56 mm.

If the value is not obtained, correct engine timing.

### 26.3.2 Adjust engine timing

Loosen fastening screw of camshaft gear. To do this, counterhold with single-head engineers wrench at hexagon of camshaft.

Position dial indicator on base circle of cam 2 and set to "0".

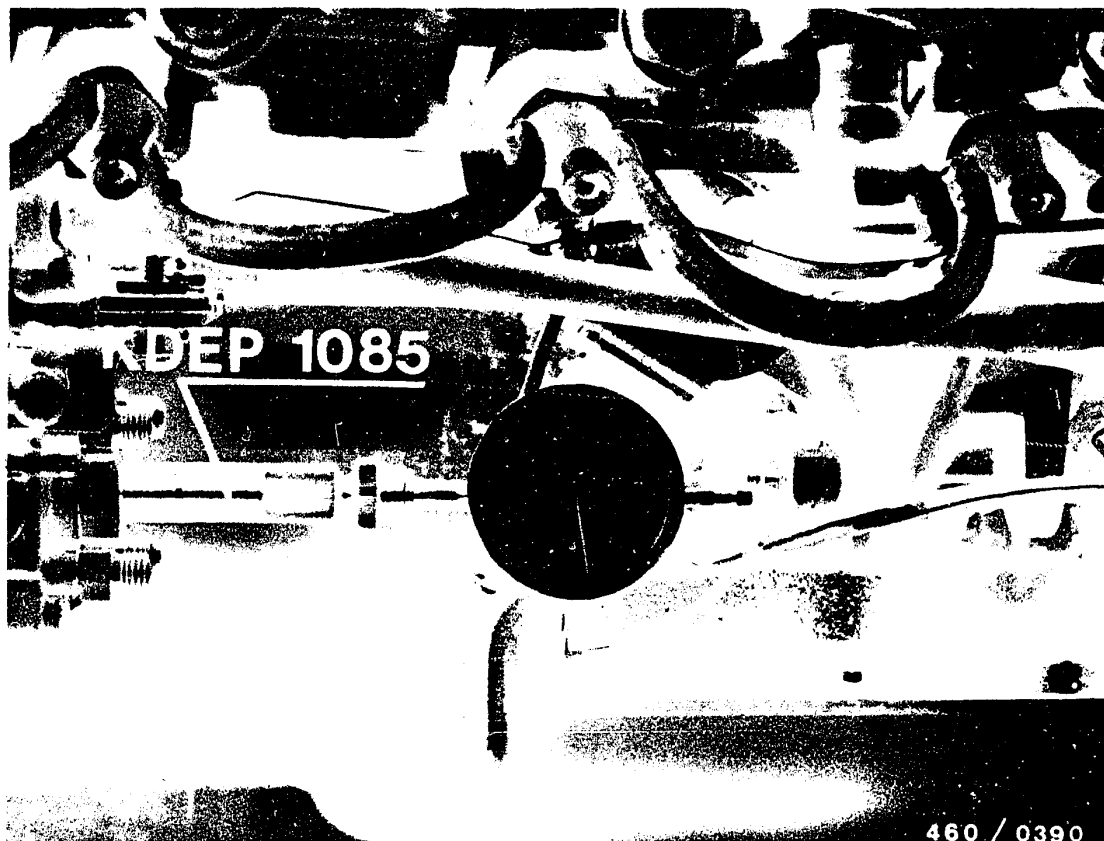
Move measuring rail 10 mm in the direction of the cam lobe.

Turn camshaft with single-head engineers wrench until a cam lift of 0.56 mm is obtained.

Conterhold camshaft gear with single-head engineers wrench and tighten fastening screw to 90 Nm.

Test tension of toothed belt.





Remove fuel-injection tubing from injection pump and from nozzle-holder assemblies.

Remove bleeder screw from central screw plug (triangular plug) of hydraulic head.

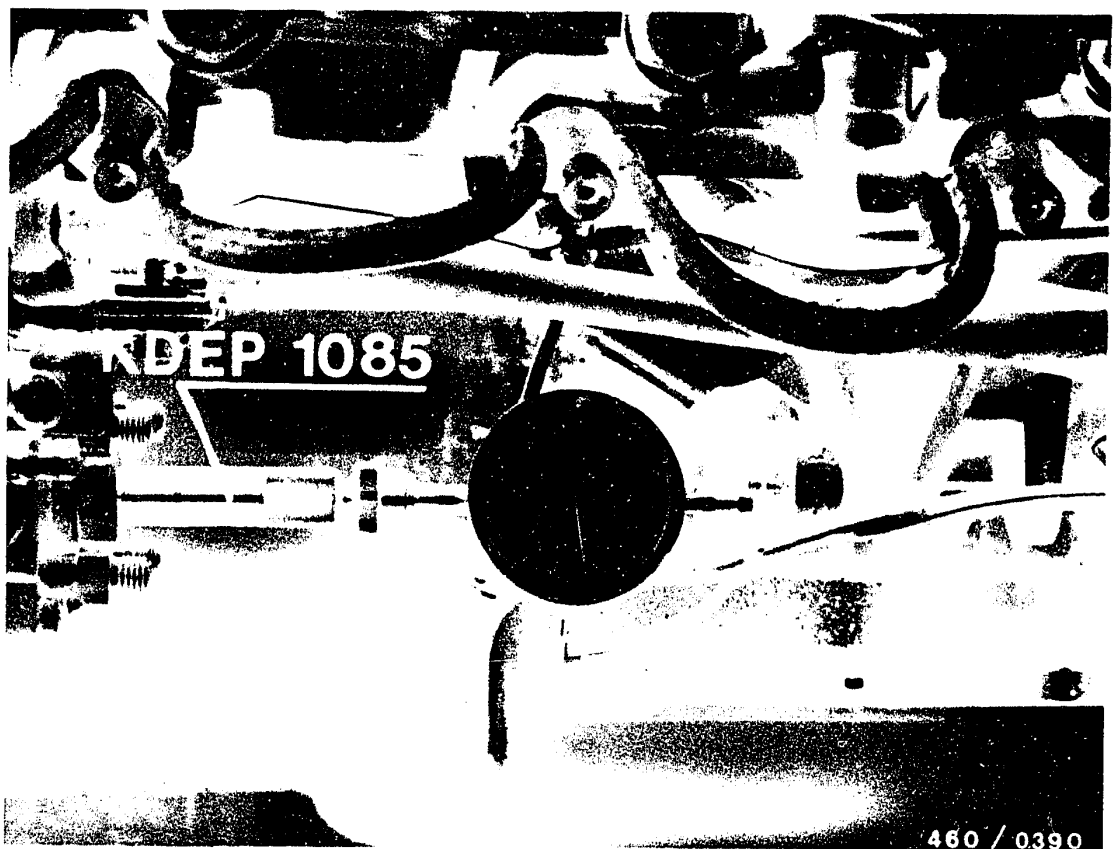
Fit measuring tool KDEP 1085 into tapped hole of bleeder screw.

Mount dial indicator with measuring insert in measuring tool KDEP 1085.

Caution:

The cold-start accelerator (KSB) must be in the zero position when testing and setting the start of delivery.



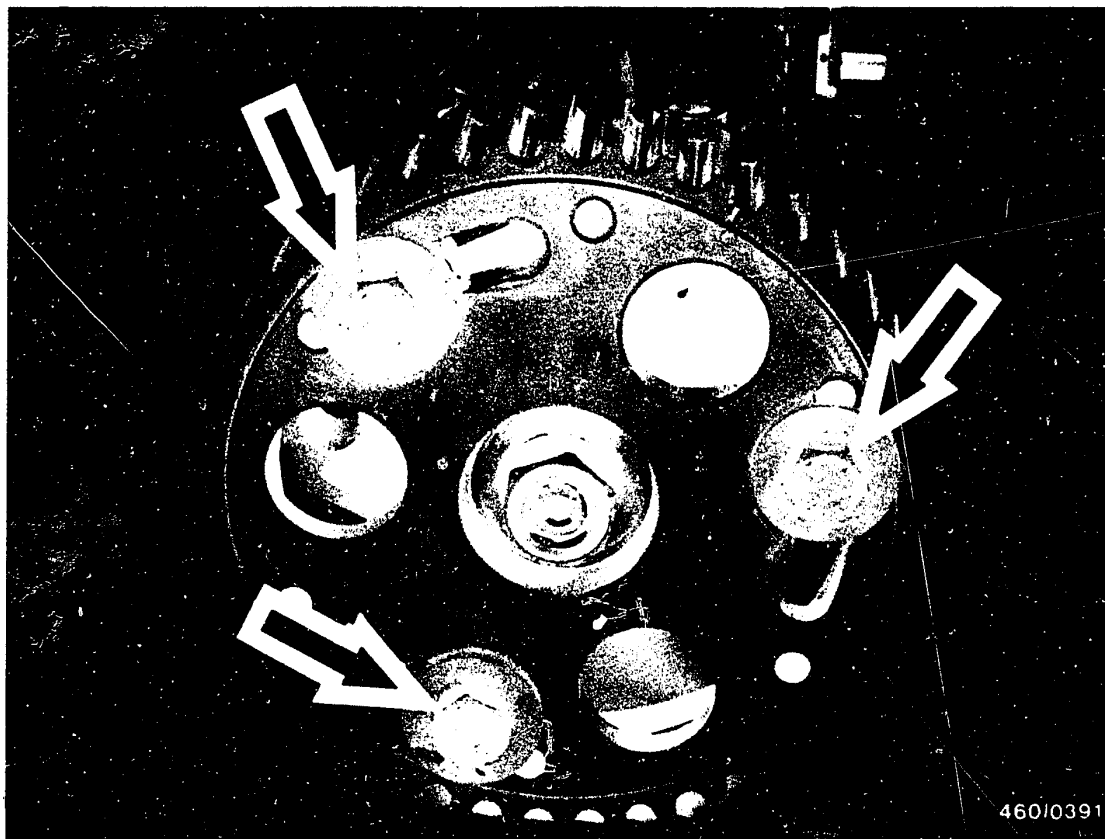


Preload dial indicator by approx. 2.5 mm.  
Turn crankshaft against direction of rotation of engine until pointer of dial indicator no longer moves.

Preload dial indicator by approx. 1 mm and set to "zero". Turn crankshaft in direction of rotation of engine until TDC mark on flywheel and mark on injection pump gear and pump bracket are in alignment.

In this position, the dial indicator must indicate a stroke of  
 $1.0 \pm 0.05$  mm after BDC ( $\rightarrow 8.85$ )  
 $0.9 \pm 0.05$  mm after BDC ( $9.85 \rightarrow$ )  
0.95 mm after BDC when there are cold-starting problems.





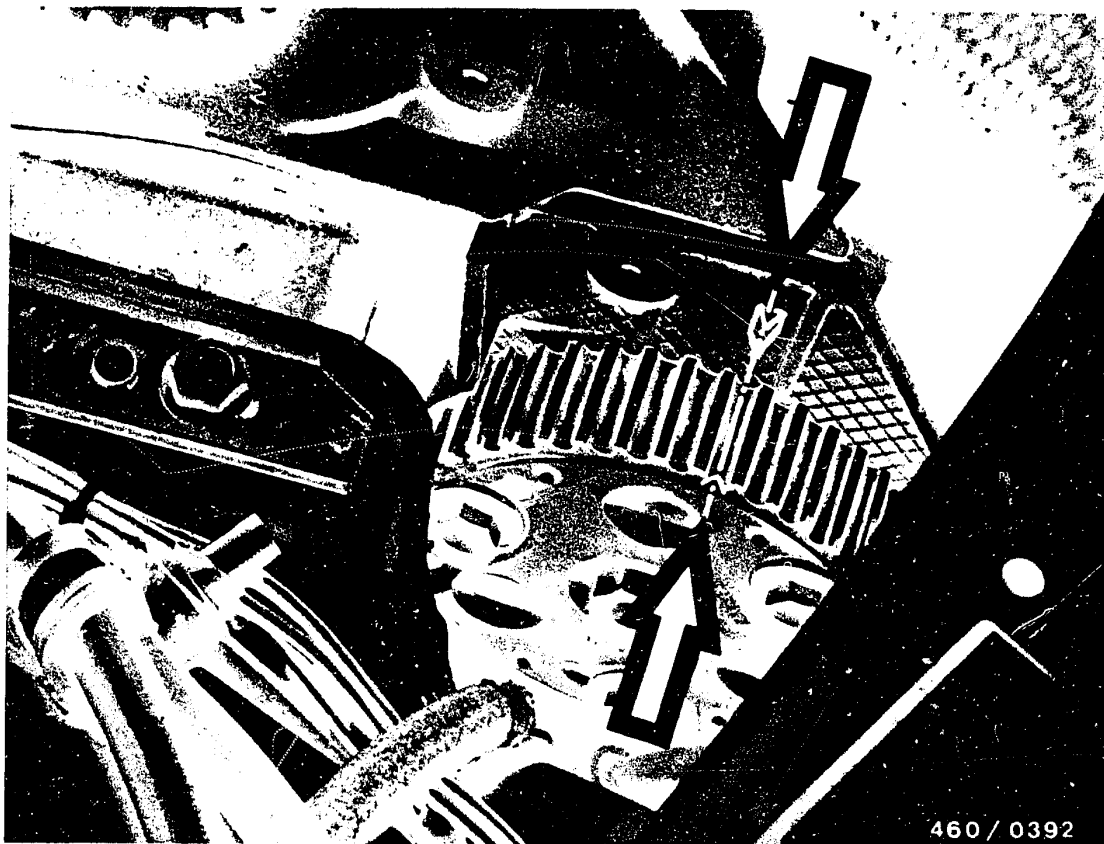
460/0391

If it is necessary to make an adjustment, loosen fastening screws (arrows) of pump hub.

**F16**

Check and adjust engine timing  
Opel Ascona/Kadett-Diesel





The fuel-injection pump is set at the two-part pump drive gear.

The mark for cylinder 1 (arrow - pump gear) is on the pump drive gear.

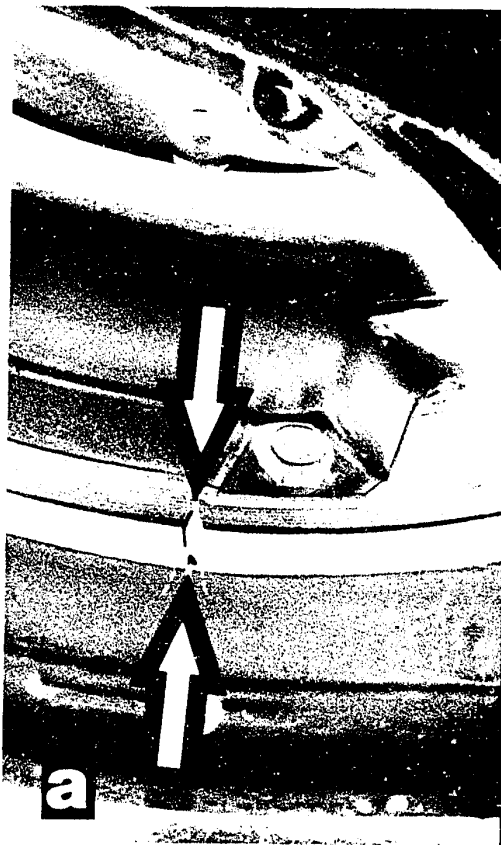
When this mark is in alignment with the mark on the pump flange (top arrow) the injection pump is at outlet "D" (cylinder 1).

**F17**

Check and adjust engine timing

Opel Ascona/Kadett-Diesel



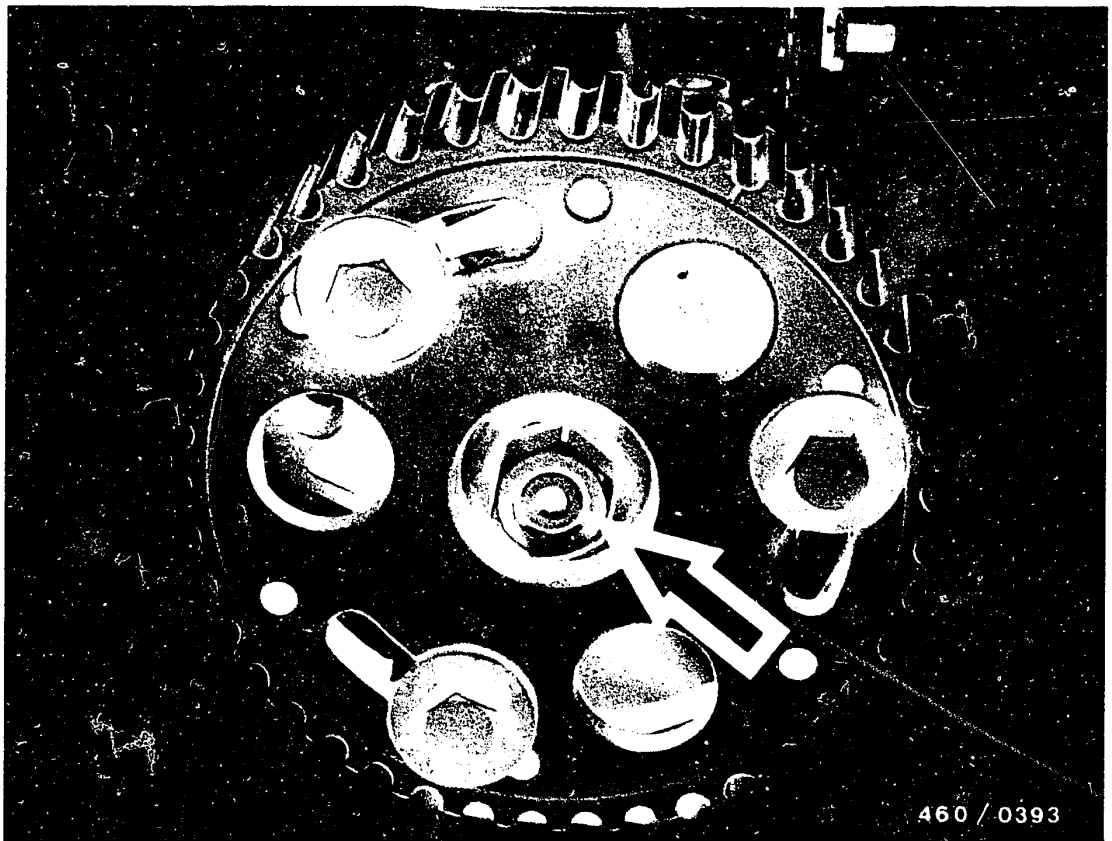


Turn ring gear so that markings on injection pump gear and pump bracket are in alignment (picture b).

Check whether TDC mark (cylinder 1) on flywheel is in alignment with reference mark (picture a).







460 / 0393

Place box wrench on fastening nut (arrow) of pump drive shaft.

Turn pump drive shaft with pump hub until stroke of  $1.0 \pm 0.05$  mm after BDC ( $\rightarrow 8.85$ )

$0.9 \pm 0.05$  mm after BDC ( $9.85 \rightarrow$ )

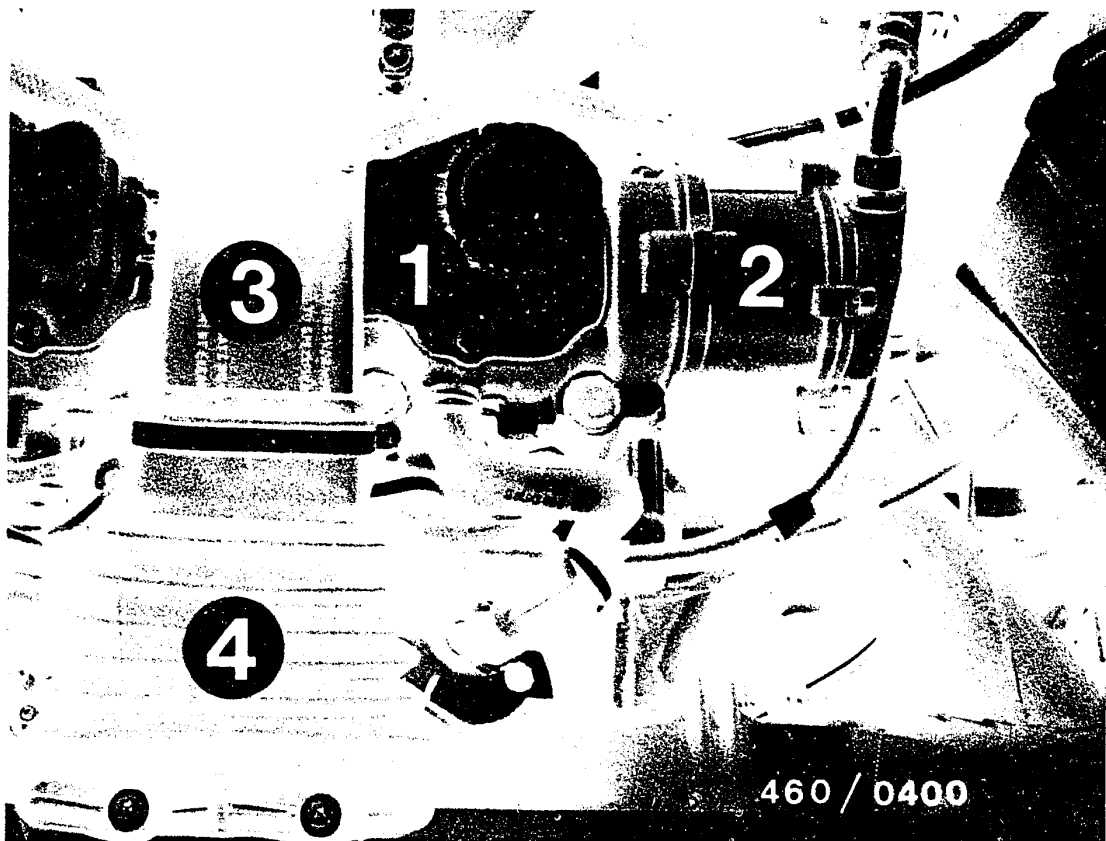
$0.95$  mm after BDC when there are cold-starting problems is obtained. Tighten fastening screws of pump hub to 25 Nm.

Turn crankshaft over twice and check setting.

Remove measuring tool KDEP 1085 with dial indicator. Mount bleeder screw with new seal ring.

Secure fuel-injection tubing to delivery-valve holders of injection pump and to nozzle-holder assemblies.





Mount upper and lower toothed-belt covers.

Mount vacuum pump (2) and covers of camshaft housing and clutch housing.

Insert air-filter housing and fasten with retaining bands (arrows).

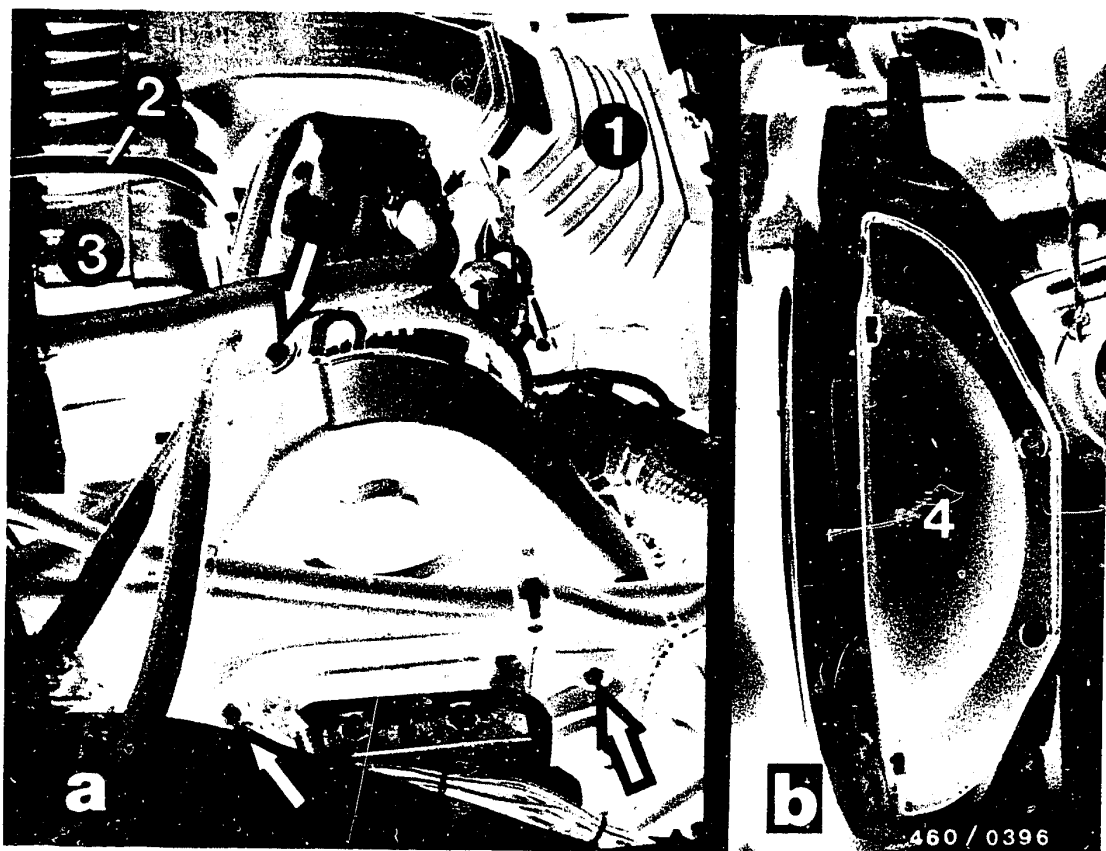
Mount pipe (3) on air-intake dome (4).

Position V-belt and tension.

Connect negative cable to battery.

Bleed fuel-injection system.





## 27. Injection timing

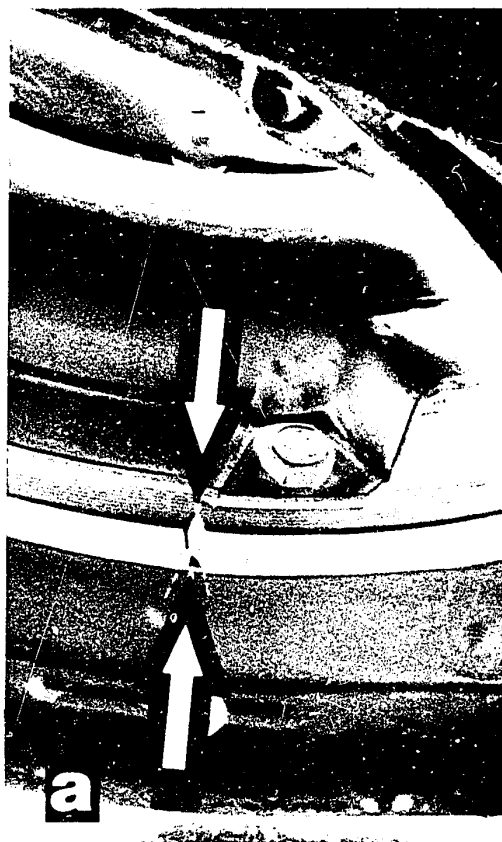
Disconnect negative cable from battery.

Remove V-belt.

Remove upper and lower toothed-belt covers (arrows) (picture a).

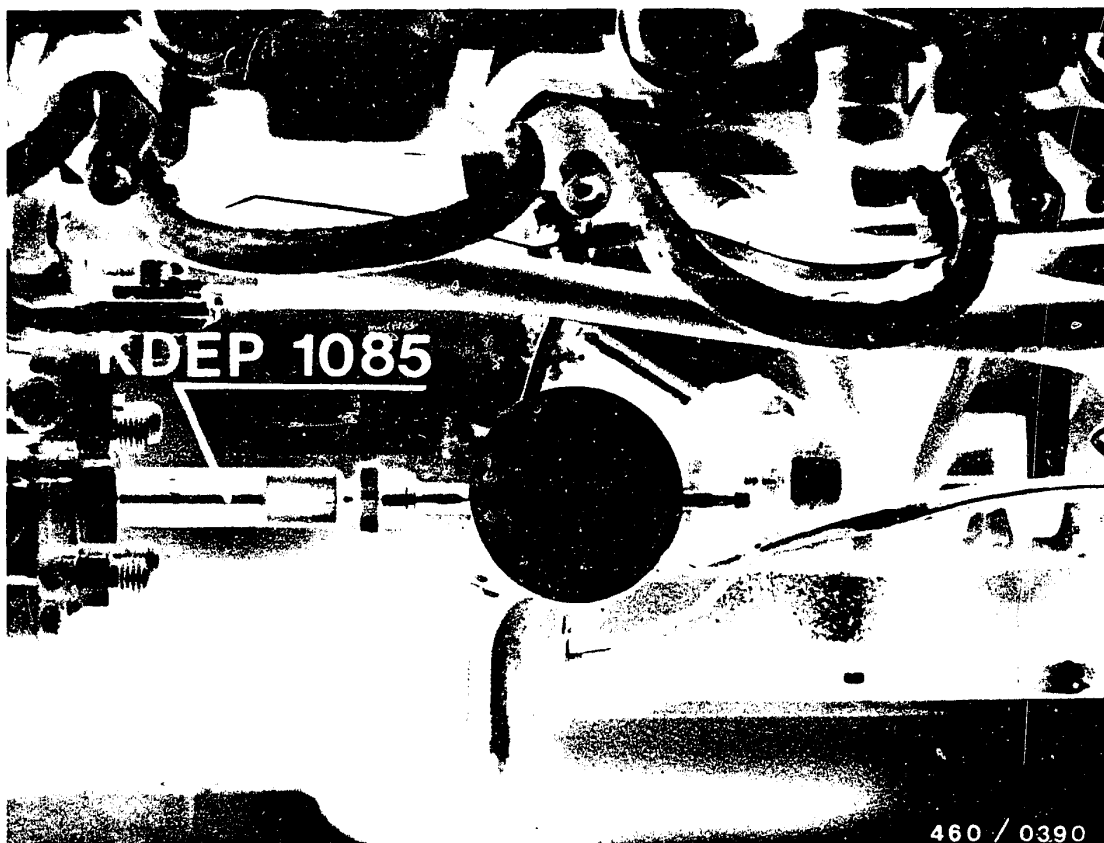
Remove cover (4) from clutch housing (picture b).





Turn crankshaft until TDC mark (cylinder 1) on flywheel is in alignment with reference mark (picture a).

In this position the marks on the injection pump gear and pump bracket must be in alignment (picture b).



Remove fuel-injection tubing from injection pump and nozzle-holder assemblies.

Remove electric lead (arrow) for solenoid-operated valve.

Remove bleeder screw from central screw plug (triangular plug) of hydraulic head.

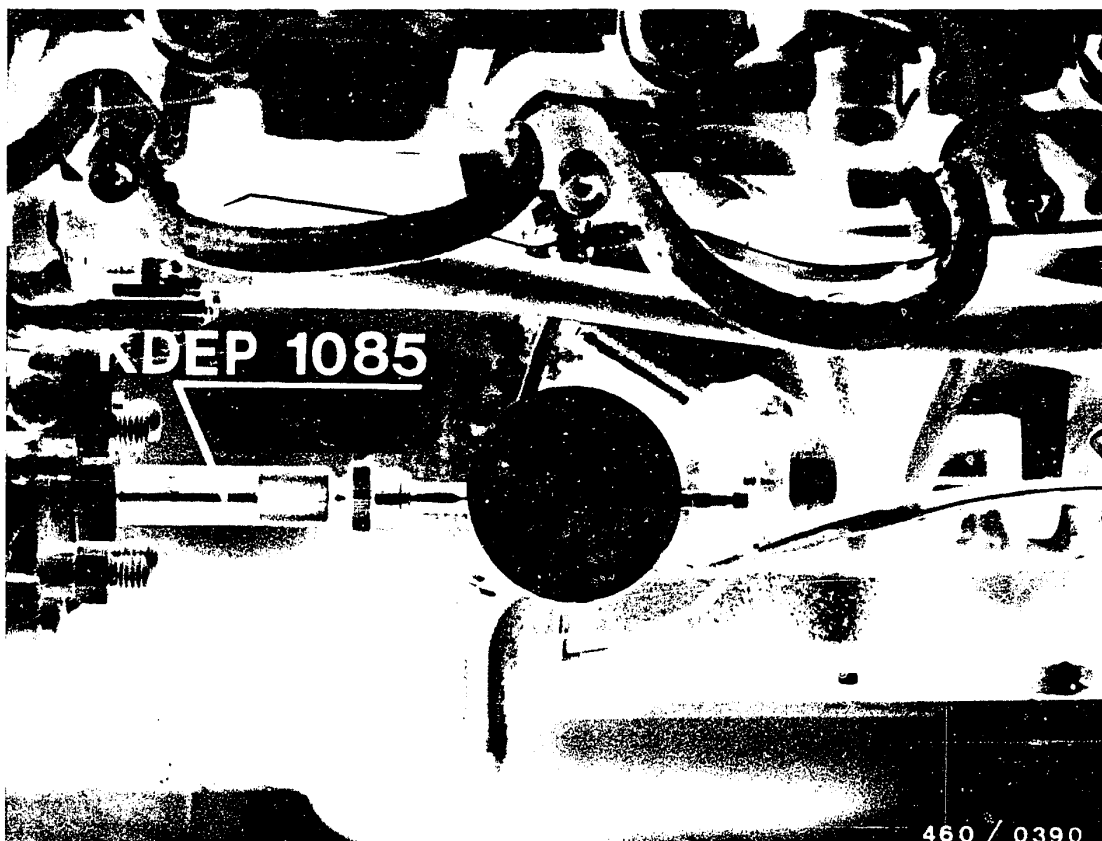
Fit measuring tool KDEP 1085 into tapped hole of bleeder screw.

Mount dial indicator with measuring insert in measuring tool KDEP 1085.

Caution:

The cold-start accelerator (KSB) must be in the zero position when testing and setting the start of delivery.





Preload dial indicator by approx. 2.5 mm.

Turn crankshaft against direction of rotation of engine until pointer of dial indicator no longer moves.

Preload dial indicator by approx. 1 mm and set to "0".

Turn crankshaft in direction of rotation of engine until TDC mark on flywheel and marks on injection pump gear and pump bracket are in alignment.

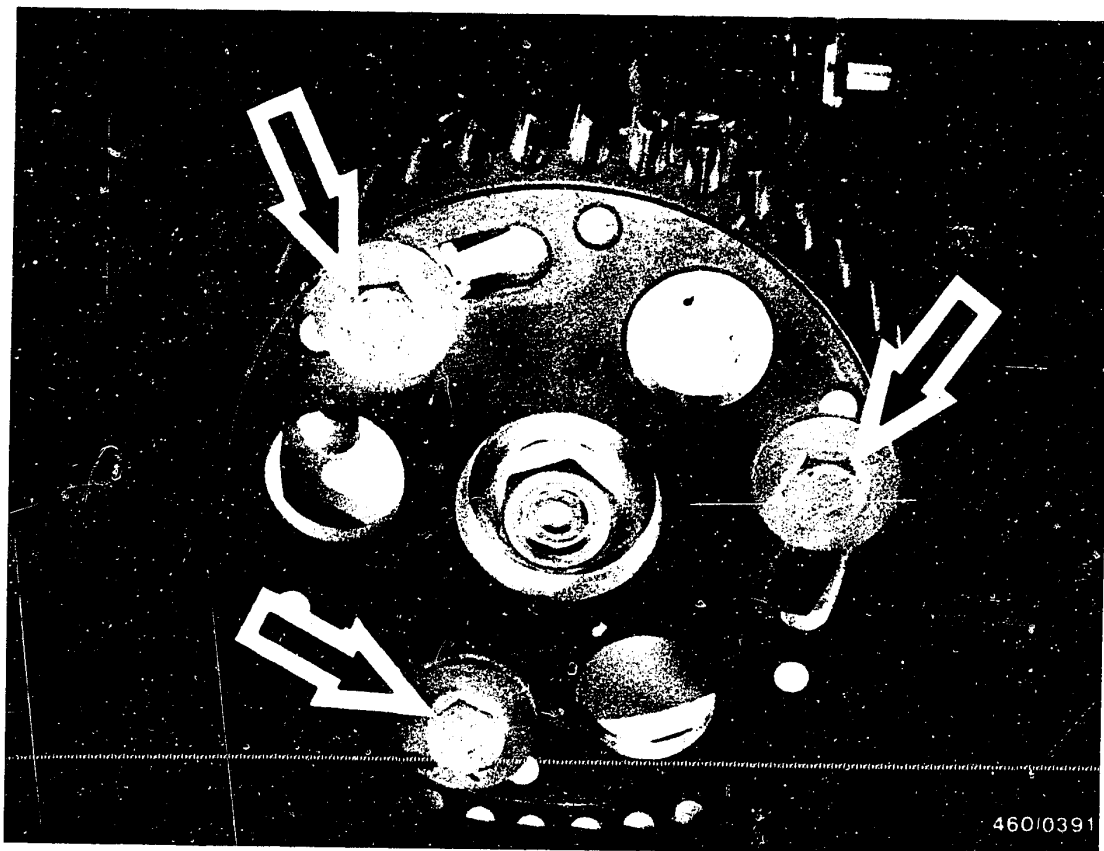
In this position, the dial indicator must indicate a stroke of

$1.0 \pm 0.05$  mm after BDC ( $\rightarrow 8.85$ )

$0.9 \pm 0.05$  mm after BDC ( $9.85 \rightarrow$ )

0.95 mm after BDC when there are cold-starting problems.





If it is necessary to make an adjustment, loosen fastening screws (arrows) of pump hub.

**G5**

Injection timing

Opel Ascona/Kadett-Diesel





The fuel-injection pump is set at the two-part pump drive gear.

The mark for cylinder 1 (arrow - pump gear) is on the pump drive gear.

When this mark is in alignment with the mark on the pump flange (top arrow) the injection pump is at outlet "D" (cylinder 1).

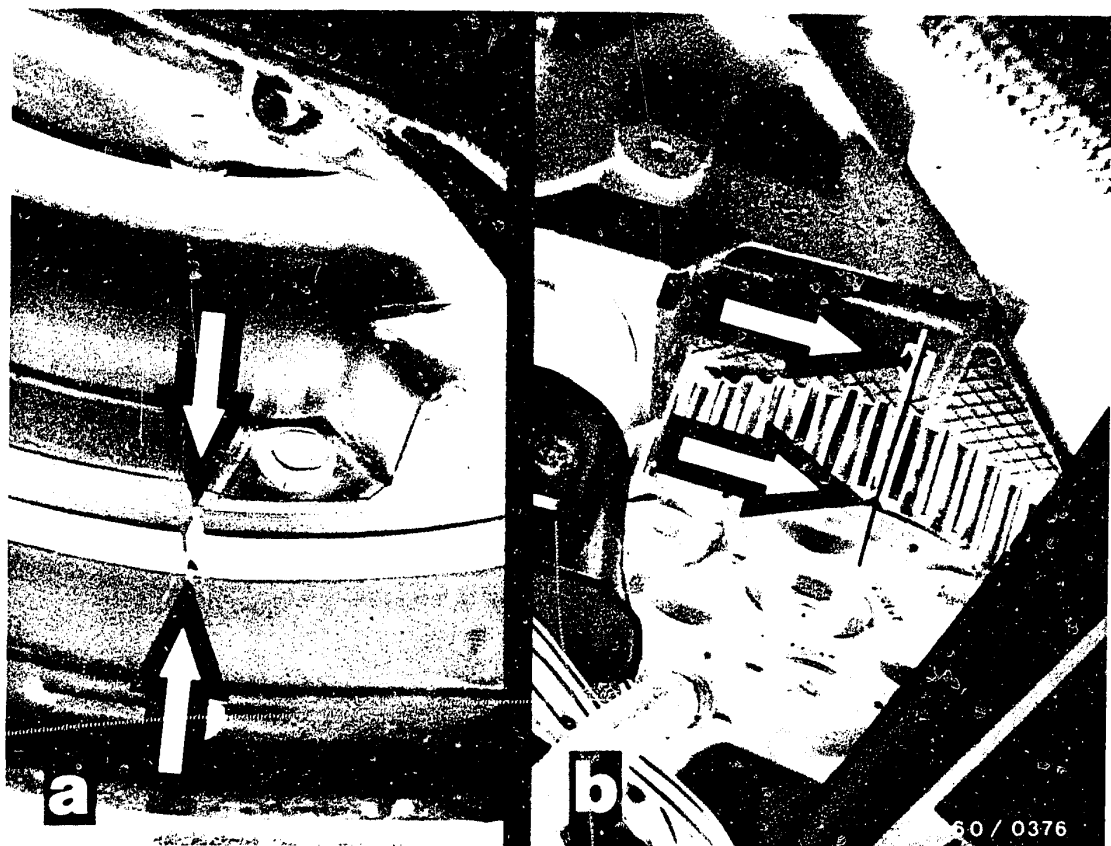
**G6**

Injection timing

Opel Ascona/Kadett-Diesel

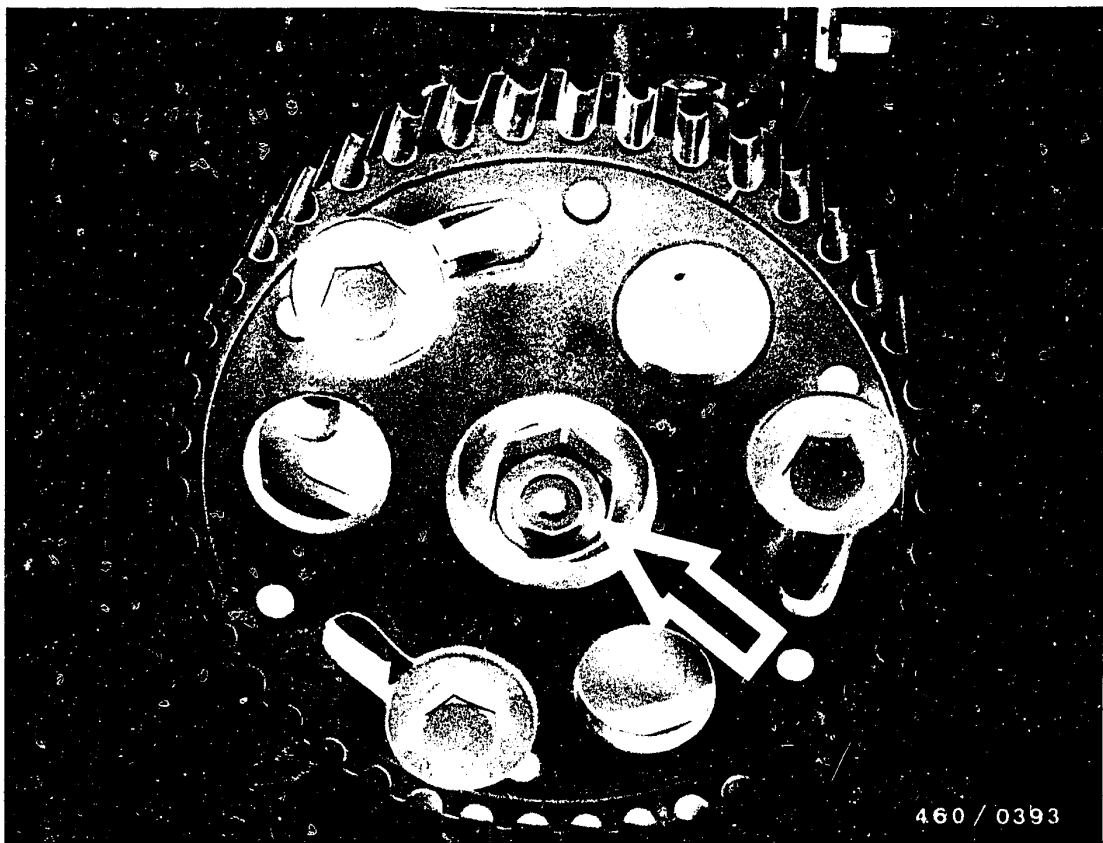






Turn ring gear so that markings on injection pump gear and pump bracket are in alignment (picture b).

Check whether TDC mark (cylinder 1) on flywheel is in alignment with reference mark (picture a).



Place box wrench on fastening nut of pump drive shaft.  
Turn pump drive shaft with pump hub until stroke of  
 $1.0 \pm 0.05$  mm after BDC ( $\rightarrow 8.85$ )  
 $0.9 \pm 0.05$  mm after BDC ( $9.85 \rightarrow$ )  
 $0.95$  mm after BDC when there are cold-starting problems  
is obtained.

Tighten fastening screws of pump hub to 25 Nm.

Turn crankshaft over twice and check setting.

Remove measuring tool KDEP 1085 with dial indicator.  
Mount bleeder screw with new seal ring.

Secure fuel-injection tubing to delivery-valve holders  
of injection pump and to nozzle-holder assemblies.

Mount upper and lower toothed-belt covers.

Position V-belt and tension.

Connect negative cable to battery.

Bleed fuel-injection system.



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